Arithmetical
RECREATIONS
OR,
ENCHIRIDION
OF
Arithmetical Queſtions:
Both Delightful and Profitable.
All of them performed without
ALGEBRA.

With ſeveral Arithmetical Problems, and their Anſwers.

ALSO,

Divers ſubtile Contracts or Agreements. A Diſcourſe concerning the harmony of Numbers, and variety of Compendiums in the ſeveral Rules of Arithmetick.

By *Will. Leybourn*, Philomathemat.

The Second Edition, Corrected, and very much enlarged by the Author.

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To the ingenious Student in the Science of Numbers.

IN *the perusal of several* Books, *some of* Vulgar, *some of* Decimal, *and some of* Algebraical Arithmetick: *as also of* Geometry, *and other of the Sciences* Mathematical; *in the viewing and reading whereof, when I met with any delightful* Arithmetical Question, *which to resolve, required more than the common* Rules *of* Vulgar Arithmetick *do afford; I noted them down, which (together with divers other, which at several times*

came into my thoughts) I have here heaped together and bound them up in this ſmall Enchiridion, *or* handful *of* Numerical Recreations, *for the delight and exerciſe of ſuch Youths and others, as are ſtudious of, and deſire to be Proficients in the* Science *of* Numbers; *knowing, that by the practice and underſtanding the reaſon of theſe, and ſuch-like Queſtions (which will not onely increaſe their knowledge in this Science, but recreate their ſpirits alſo) they ſhall with delight attain to a greater, and more than ordinary degree of knowledge in a ſhort time, than by learning of* Arithmetick, *as (for the moſt part) it is taught in Schools, in many Weeks. For, by the practiſing and*

and right underſtanding of the reaſon of the reſolving any few of theſe Queſtions, he ſhall accumulate to himſelf more profit in this Science, than by ſitting at School two or three daies; nay, (it may be) ſome Weeks, Multiplying and Dividing a great number of Figures, which when he hath done, (to his great loſs of time) he knows not what he hath done, nor, ſometimes, the Maſter which putteth a Youth upon ſuch labour; which is as unneceſſary for a Youth, as it is toylſome in performance.

But I ſpeak not this, neither publiſh I this Manual, *to the end it ſhould be the onely Study and Practice of Youth; or to deter their Parents from putting them to School to learn Arithmetick,*

which is a Jewel fit to adorn all ſorts and degrees of Men, from the higheſt to the loweſt: but as uſeful Recreation, at ſpare hours, for Boys at School, to appoſe one another in; and at vacant times between their School-hours, to buſie and delight themſelves withal. For what is more pleaſing to Youth than Recreation? And what Recreation can be better make choice of, than that which will increaſe his knowledge?

We ſee by experience, that Man after Toyl & Labour deſireth Reſt, and after that returns again to his wonted employment, with the greater vigour and alacrity. And this is not experimentally true in Man only, but in other Creatures alſo, as may appear by that of the Poet.

READER.

A *Field* left fallow ſome few
years, will yeild
The richer Crop, when it again
is Till'd:
A *River* ſtopped by a Sluce a
ſpace,
Runs after rougher, and a ſwif-
ter pace.
A *Bow* a while unbent, will af-
ter caſt
Its Shafts the farther, and them
fix more faſt.
A *Souldier* that a Seaſon ſtill
hath lain,
Comes with more fury to the
Field again.
Even ſo our *Body* while to
gather breath,
From *Reſt* to *Pain* again it
ſojourneth;

It recollects its Powers, and with cheer
Falls fresh again into its first career.

For this, and the fore-mentioned ends and purposes, I have collected these following Numerical Recreations; *in which, if thou takest as much delight in the Practice of them, as I have done in the Composure, thou shalt in the end finde thy labour not lost, or (when thou comest to years of discretion) think thy time ill spent.*

The Questions are in number 60, *intermixed one with another, having no dependance or coherence, every one proving it self without reference to any Rule in Vulgar* Arithmetick, *but the*

the reaſon of each Proof, is to the Eye viſible, in the operation it ſelf.

I could have made the number of Queſtions greater, but it would have been to little purpoſe; for he that can work (and underſtand the reaſon of working) theſe, may vary and make theſe 60 *amount unto* 600.

Unto the forementioned 60 Queſtions, *I have added* 15 *other* Queſtions, *by way of* Problem, *with their* Anſwers; *omitting the manner of the working of them, ſo that the ingenious* Practitioner *may exerciſe himſelf therein; which will give him ſufficient light, and confirm him in the reſolving of the like when they ſhall be propounded to him.*

After theſe Problems, *I have*

inſerted (by way of Diſcourſe *only) ſeveral* Agreements *and* Contracts, *between Party and Party, ſeeming fair and reaſonable at their Propoſing, which the ſubtilty of* Numbers *diſcovers to be either* impoſſible *in the* Performance, *or* fallacious *in the* intent *of the party that offers them: All which are intermixed with other* pleaſant *and* profitable Diſcourſes *of ſeveral kindes. And herein alſo I have declared the* Subtilty, Propriety, *and ſecret* Harmony *that there is in ſome* Numbers, *both in* themſelves, *and being joyned with* others.

And in the laſt place, I have added divers compendious Rules *in* Arithmetick, *which will be*

of

of good uſe to ſuch that have occaſion to deal in the Multiplying *and* Dividing *of great* Numbers, *& for other purpoſes alſo. I might have added more, but theſe were ſuch that at the preſent came into my minde, and, I think they are ſuch as are as* neceſſary, *as any other I could think upon; I am ſure they are as* uſeful, *and eſpecially to thoſe whoſe Memories are not ſo quick and ready to* Multiply *and* Divide *as ſome others are.*

As I finde theſe accepted, I ſhall be the more animated to enlarge them, as occaſion ſhall offer it ſelf; in the mean time, take this Treatiſe *as it is;* peruſe it, *and* practice *it; and if thou finde any thing therein to thy advantage*

vantage, make good use of it, and thank the Editor.

Vale.

Fare ever well, so ever wishes he
Who is more thine, than he can seem to be.

Arithmetical
RECREATIONS:
OR,
Enchiridion, &c.

QUEST. 1.

How to finde the Number which any perſon ſhall think upon, be it never ſo great.

BID the party which thinketh double his thought, and multiply that double by 5, and give you the ſum or product of that Multiplication; from which ſum or product, if you omit the laſt Figure thereof, which ſtandeth towards your Right hand, (which will always be a Cypher) the remaining Figure or Figures ſhall be the number

number which the party thought upon.

Example.

Suppoſe the party ſhould think upon 93, that doubled makes 186, which being multiplyed by 5, the product will be 930; from which ſum if you omit the laſt Figure towards the Right-hand, (which is here a Cypher) the reſt will be 93, the number which the party thought upon.

But becauſe the laſt place being always a Cypher, may cauſe the other party which thinketh to conceive it eaſily, they being the very Figures which he thought remaining; it will be neceſſary (the more to obſcure the buſineſs) to bid him adde to the laſt product ſome other Number, what you pleaſe, and then let him give you the ſum of all; from which, firſt ſubſtracting the Number you bid him adde, and then omitting the laſt

Figure

Figure or Cypher, the remainer then ſhall alſo be the number which the party thought at firſt.

Example.

Suppoſe a party ſhould think upon 297, this doubled will be 594, which being multiplied by 5, produceth 2970; to which (the more to evade the buſineſs) bid him adde 131, or any other number, and then give you the ſum, which will then be 3101: from which number, if you privately ſubſtract the 131, which you bid him adde, there will remain 2970, from which take the Cypher, and there will remain 297, the Number which the party firſt thought upon.

QUEST.

QUEST. 2.

If two, three, four, or five perſons ſhould each of them think upon a ſeveral Number, to tell what Number each perſon thought upon, provided that none of the perſons think above 9.

LEt the firſt party double the number he thought, and to that adde 5, and that ſum multiply by 5, and to it adde 10: If from this Number you privately ſubſtract 35, the firſt Figure of the remainder towards the Left hand ſhall be the Number that the firſt party thought upon.

Example.

If the party think ——— 7
That doubled makes ——— 14

To

To which adde 5, makes ——— 19
This 19 multiplied by 5, makes ··· 95
To which adde 10, it is ——— 105
From this 105 take 35, there will remain 70, the firſt Figure whereof is 7, the Number thought.

This you may do if one perſon onely think: but if two, three, four, or five perſons think, it will ſtill be the ſame.

Example.

Let three perſons, *William*, *James*, and *Thomas*, think theſe three Numbers, 4, 9 and 6.

William's Number is ——— 4
Which bid him double, it makes··· 8
To which let him adde 5, it makes- 13
Which let him multiply by 5, it produceth ——— 65
To this let him adde 10, it makes·· 75

To this product let *James* privately adde his Number ——— 9
It makes ··· ——— 84

Which

Which let him multiply by 10, it makes ——— 840

To this product let *Thomas* privately adde his Number ——— 6

It makes ——— 846

Which let him multiply by 10, it makes ——— 8460

This done, bid them give you this last product, which is 8460: from this product 8460, do you substract 3500, and there will remain 4960; the Cypher being omitted, there will be left 4 9 6, which were the three Numbers that the three parties thought.

Note, that if one party think, then you must take onely 35 *from the last product: if two parties think, take* 350; *if three parties, take* 3500; *and if four parties,* 35000, &c.

QUEST.

QUEST. 3.

A more artificial way to finde the Number that any perſon thinketh upon, without asking him any Queſtions.

LEt the party that thinketh multiply the Number which he thought upon, by what Number he pleaſeth; then bid him divide the product of that multiplication, by what other Number he pleaſeth. Again, let him multiply this Quotient by what Number he pleaſeth, and divide that Quotient again by what other Number he thinketh fit; and let him thus continue Multiplying and Dividing as many, or as few, times as he pleaſeth, either 2, 3, 4 or 5 times, or more or leſs at pleaſure [*Onely ſo often as he Multiplies and Divides, let him tell you by what Num-*

bers

bers he multiplies and divides.] And when he hath Multiplied and Divided as often as he liſteth, bid him divide his laſt Number by the Number he thought upon, and keep the Quotient to himſelf.

In like manner do you take any Number at adventure, and privately Multiply and Divide it as often as he doth, and by the ſame number as he doth; and when you have done it as often as he hath done, and divided your laſt number by the number that you ſuppoſed, you ſhall finde your laſt Quotient will be the ſame with his.

Then to know his number which he thought upon at firſt, bid him adde his laſt Quotient to the Number which he thought upon, and give you the ſum; from which ſum ſubſtract your laſt Quotient, and the number which he thought upon will remain.

Example.

Suppoſe a party ſhould think upon-50
And multiply it by 4, it makes---200
And divide that product by 2, it makes ——— 100
And multiply that Quotient again by 6, it makes ——— -600.
And divide that again by 4, it makes ——— - 150

And thus he may Multiply and Divide, again and again, if he pleaſeth.

In the mean time, ſuppoſe you ſhould privately think upon ———--40
That multiplied by 4, maketh --- 160
And divided by 2, produceth—— 80
Which multiplied again by 6, giveth ——— --- 480
And divided by 4, produceth —— 120

Here you ſee that his laſt Quotient is 150, which if he divide by 50, the number which he thought, the Quotient will be 3. In

In like mauner your laſt Quotient is 120, which if you divide by 40, (the number which you ſuppoſed) your Quotient will be alſo 3, equal to his.

Now bid him add his laſt Quotient to his number thought, and give you the ſum, which is 53, from which if you ſubſtract your laſt Quotient 3, there will remain 50, the Number which he firſt thought upon.

Again, this being a very delightful and pleaſant Queſtion, wherein there is couched much of the ſubtilty of numbers, I will not let it paſs with one Example, but give you another.

Let the party think ——— --25
And multiply it by 8, makes —— 200
Divide that by 4, gives ——— -50
That he multiplies by 3, gives --- 150
And divides it by 5, gives ——— 30

This 30 being divided by 25, his Number thought, giveth in the Quotient $1\frac{5}{25}$ or $1\frac{1}{5}$.

Now

Now ſuppoſe you imagine ——— 30
And multiply that by 8, it makes- 240
And divide it by 4, it produceth-- 60
Which multiplied by 3, giveth--- 180
This divided by 5, gives ———— 36

This 36 being divided by 30, your Number ſuppoſed, giveth in the Quotient $1,\frac{6}{10}$ or $1\frac{3}{5}$ equal to his laſt Quotient.

Now if he adde 25 his Number thought, to $1\frac{3}{5}$ his laſt Number, the Sum will be $26\frac{3}{5}$; from which if you take $1\frac{3}{5}$ your Quotient, there will remain 25, the Number which he thought.

QUEST.

QUEST. 4.

If a Pile of Counters, or other pieces of Money, or other things, lie on a heap together; and three parties take out from them a certain number unknown to you; by knowing the ſum of them all, to finde how many each party took.

BId one of the parties take from the Heap either 4, 8, 12, 32, 64, or any other number which may be divided by 4, and keep them to himſelf. Then ſay to the ſecond party, For every four pieces that he hath, do you take ſeven pieces: And let the third party for every four pieces that the firſt had, take 13 pieces: which when they have done, bid them put

put them all together, and give you the Sum; which do you divide privately by 3, the Quotient ſhall be double to the Number which the firſt party took.

Example.

Suppoſe the firſt party took 12, that is three times 4; then the ſecond perſon for every four muſt take 7, that is three times 7, or 21. Laſtly, The third perſon muſt take three times 13, that is 39: Theſe three parcels being put together, make 72, which if you divide by 3, the Quotient will be 24, the half whereof is 12, the Number of Pieces that the firſt party took.

QUEST. 5.

Any Number of Counters, Stones, Eggs, or other things being laid in a row, to tell what Number any perſon, ſitting by, thinketh upon, provided the party think not a number greater than the number of Counters, Stones, Eggs, &c. which lie before him.

LEt the nine ● following repreſent nine Counters, or the like.

● ● ● ● ● ● ● ● ●

Do you (privately to your ſelf) call that which lieth next your Left-hand One, the next Two, the third Three, &c. that then towards your Right-hand will be 9. Then bid any perſon think any Number under

der 9, and pitch his Finger upon which of the Counters he pleaſeth: then (you knowing privately which Counter it is, whether the firſt, ſecond, third, or any other) adde 9 privately to that number; as if the party ſhould lay his Finger upon the ſixth Counter, adde 9 privately thereto, and it makes 15: therefore bid the party count to himſelf from that number which he thought, till he make it 15; and that Counter upon which the number 15 falleth, is the Number which the party thought upon.

Example.

Let the nine Counters lie as here you ſee.

Then ſuppoſe a party ſhould think

B 2 upon

upon 2, and that he ſhould pitch his finger upon the Counter noted with A, (which is the ſixth Counter.) Now (becauſe he pitched upon the ſixth Counter) adde privately 9 to 6, and it will make 15 : Wherefore, bid him count from the number which he thought upon (beginning at A backwards, till he come to 15) and his number will end at the Counter B, which is the ſecond Counter, denoting that he thought upon 2. For (being he thought upon 2) if he call the Counter A 2, the next Counter towards the Left-hand muſt be 3, the next 4, the next 5; and ſo the firſt Counter will be 7, then the laſt Counter will be 8, and the next to it 9; and ſo 15 will end at the Counter B, which is the ſecond Counter, and denotes his number thought upon to be 2. And here note, that whereas here are onely 9 Counters placed, there might as well have been any other number, as 10, 12, 16, 20, 24, or any other number : only

only remember this, that whereas here you added 9 to the Number of the Counters that the party pitched his Finger upon, you then adde that number which is equal to the number of Counters lying before you; as if 10, then adde 10; if 12, adde 12: if 20, adde 20, &c.

This is the way by which ſome will diſpoſe the ſeveral Spots of the Cards, and lay them with the Face downwards in order of a Dyal, counting the Ace 1, the Duce 2, the Tray 3, &c. the Queen 11, and the King 12: by which they will undertake to tell what Hour you think upon; which is very pleaſant to practiſe, and ſeeming ſtrange to thoſe who know not the reaſon of it.

QUEST. 6.

One perſon having two Bottles of Wine, in each hand one, the one being Sack, and the other Claret, (or any other two things, as two pieces of Money, &c. provided the one be even and the other odde) to finde in which Hand the Bottle of Sack is, and in which the Claret; or in which Hand the odde, and in which the even piece of Money is.

LEt any perſon have in his hands two Bottles, one full of Sack, the other full of Claret; how to know in which hand he hath the Sack, and in which the Claret: to effect it, do thus:

Bid the party that hath the Bottles in

in his hands to double the price of the Wine which he hath in his Left-hand, and treble the price of that Wine which he hath in his Right-hand; then bid him adde both Numbers together, and ask him whether it be even or odde: If it be even, the Sack (or even piece of Money) is in the Right-hand; but if it be odde, the Claret (or odde piece of Money) is in the Right-hand.

Example.

Let one have a Bottle of Sack (or 12 *d.*) in his Left-hand, and a Bottle of Claret (or 5 *d.*) in his Right-hand; he having thus disposed them unknown to you, bid him double the Money in his Right-hand, it is 24; then bid him treble the piece which is in his Left-hand, and it is 15; then bid him adde them both together, and they make 39: for 24 and 15 is 39. This done, ask him whether the Number be even or odde

He will ſay, Odde. Then tell him he hath the Sack or 12 *d.* in his Left-hand, and the Claret or 5 *d.* in his Right.

Or if he had had the Sack in his Left-hand, and the Claret in his right, and you had ſaid, Double that in your Right-hand, it makes 10, and treble that in your Left, it makes 36; adde them together, they make 46; it being even, denotes the Claret or odde number to be in the Right-hand. Wherefore obſerve this always:

If you double the Right-hand, and the number be even, the odde number is in the right. If you double the Right-hand, and the Number be odde, the even number is in the Right.

If you treble the Right-hand, and the Number be even, the even number is in the right. If you treble the Right-hand, and the number be odde, the odde number is in the right.

This

This may be done by two parties, interchanging two pieces of Money, or by giving two persons two Cards, one odde, the other even; and placing them before you, that you suppose one to be the Right-hand, and the other the Left.

QUEST. 7.

A man being 100 *years of Age, upon his Birth-day had his three Sons with him at Dinner, namely,* William, James *and* Thomas: *the Father saying to them, Well Sons, I am this day just* 100 *years old; The Youngest,* William, *said, Father; my Brother* Thomas *is four times as old as I am, and my Brother* James *is three times as old as I am,*

and all our Ages together are juſt 100 *years. How old was each of the three Sons?*

TO reſolve this, ſay, *William* was one year old; then *James* muſt be three times his age, that is, three years old; and *Thomas* muſt be four times his age, that is, four years old. Now all theſe added together make but eight years, whereas they ſhould be 100 years: Wherefore, divide 100 by 8, and the Quotient will be $12\frac{4}{8}$, that is, 12 years and an half for the age of *William*. Then,

	Years.	Months.	
William being	12 ——	6	
James muſt be	37 ——	6	Three times as much, and
Thomas muſt be	50 ——	0	Four times as much:
In all	100 ——	0	Equal to the Fathers Age.

QUEST.

QUEST. 8.

A man dies, and leaves a Legacy of 900 l. *to be diſpoſed of among four of his Relations,* viz. *A, B, C, and D; which Legacie is to be diſpoſed of in this order: B is to have twice as much as A, and C thrice as much as B, and D is to have as much and half as much as C: What muſt each perſon have?*

TO effect this, or the like, ſuppoſe that A were to have 1 *l.* then B muſt have 2 *l.* which is twice as much; and C muſt have 6 *l.* which is three times as much as B; and D muſt have 9 *l.* which is as much and half as much as C.

Theſe Numbers added together make

make 18: divide 900, the whole Legacie, by 18, the Quotient will be 50 *l.* for A, then B must have 100 *l.* and C 300 *l.* and D 450 *l.* which all being added together, make 900 *l.* equal to the whole Legacie, and so disposed according to the Donor's Will, as by the work following may appear.

						l.
A	1	~~4~~		*l.*	A	50
B	2	~~900~~		(50	B	100
C	6	~~188~~			C	300
D	9	~~1~~			D	450
	18					900

QUEST.

QUEST. 9.

A man dies and leaves 3000 *l. to be diſtributed to his Wife, his Son, and his two Daughters, in this wiſe; That the Son's Portion ſhould be double to that of the Mother, and the Mothers Portion double to each of the Daughters. How much muſt each of their Portions be?*

SUppoſe the Portion of one of the Daughters to be 1 *l.* then the Mothers Portion muſt be double to one of the Daughters, (or equal to them both) namely 2 *l.* and the Son's Portion muſt be double to the Mothers, namely 4 *l.* Theſe four Portions added together, make 8 *l.* (as in the Example is expreſt) but they

they ſhould be equal to 3000 *l.* Wherefore divide 3000 by 8, and the Quotient will be 375 *l.* for one of the Daughters Portions: Then the Mothers is twice as much, namely 750 *l.* and the Son's double to that, namely 1500 *l.* All which is viſible by the following Work.

	l.		
One Daughter ——	1		
The other Daughter--	1	64	*l.*
The Mother —— ---	2	3000	(375
The Son —— —— --	4	888	
The Sum ——	8		

One Daughter- —— -	375
The other Daughter——	375
The Mother —— ——	750
The Son —— —— --	1500
The Sum —— —— -	3000

QUEST.

QUEST. 10.

There were in company together four perſons, Adam, Edward, Charles, *and* William. Adam *told* Edward *that he was older than him by two years:* Charles *told them that he was as old as both of them together, and four years over.* William *hearing them ſay ſo, ſaid to them, I am juſt 96 years old, and that is equal to all your Ages. Now how old was* Adam, Edward *and* Charles *ſeverally?*

SUppoſe *Edward* were 1 year old, then *Adam* for *Edward*'s age put (1) then *Adam*'s age muſt be (1 more by 2); and *Charles* his age muſt be (2 more by 6): Theſe three

three ages added together in this manner, as is here expreſſed:

Edward ——	1	
Adam ——	1	more by 2
Charles ——	2	more by 6
	4	more by 8

This 4 more by 8 ſhould be equal to 96, *William*'s Age, had your Suppoſition been right; but being it is not, take 8 out of 96, and there will remain 88; which divide by 4, and the Quotient will be 22, which is *Edward*'s Age.--- Then according to the Queſtion, *Edward* being 22 years old, *Adam* muſt be 24 years old, which is as old as *Edward*, and 2 years more: then *Charles* muſt be 50 years old, which is as old as *Edward* and *Charles* together, and 4 years over. So all their Ages added together, make 96 years, equal to *William*'s Age, as here appeareth.

Edward

Edward —— 22
Adam —— —— 24
Charles —— ·50

William's Age– 96

QUEST. 11.

Three perſons, Andrew, Benjamin *and* Charles *are to go a Journey of* 235 *Miles; of this Journey,* Andrew *is to go a certain number of Miles unknown;* Benjamin *is to go four times as many miles as* Andrew, *and three miles more; and* Charles *is to go twice as many miles as* Benjamin, *and five miles more. How many Miles muſt each of theſe perſons travel ſeverally*

rally, to make out their Journey 235 Miles?

Suppoſe that *Andrew* went onely one mile; then *Benjamin* muſt go four times as much, that is, 4 miles, and 3 over: Then *Charles* muſt go twice as much as *Benjamin*, which is 8 miles, and 5 over. Theſe Numbers added together, as here you ſee, make but 13 Miles, and 8 over: Whereas the ſum of all their Journey ſhould be 235 miles.

Andrew travelled 1 mile.
Benjamin travelled 4 miles, and 3 over.
Charles travelled 8 Miles, and 5 over.

The Sum —— 13 miles, and 8 over.

Wherefore, becauſe your Suppoſition was not right, ſubſtract the 8 over-miles from 235, (the number of

of Miles they were to go in all) and the remainder will be 227: divide 227 by 13, and the Quotient will be $17\frac{6}{13}$; so that *Andrew* for his share must travel 17 miles, and $\frac{6}{13}$ of a Mile. And *Benjamin* must travel 4 times as much, which is $68\frac{24}{13}$, and 3 miles more. And *Charles* must go twice as far as he, which is $136\frac{48}{13}$, and 5 miles more. All which being added together, will make 235 miles; as you may here see.

Andrew must go----	$17\frac{6}{13}$	
Benjamin ———	$68\frac{24}{13}$	more 3
Charles-———	$136\frac{48}{13}$	more 5
The Sum —	$221\frac{78}{13}$	more 8

Here the Sum is 221 Miles, and $\frac{78}{13}$, which makes just 6 Miles, and the 8 Miles more makes 235, which answers the Question.

QUEST.

QUEST. 12.

The Captain, Lieutenant, and Cornet of a Troop have taken among them from ſome Enemy 478 *Crowns, which they agree to ſhare in this manner: The Captain is to have* 24 *times as much as the Cornet, wanting onely* 7 *Crowns; and the Lieutenant is to have* 5 *times as much as the Cornet, wanting* 3 *Crowns. I demand how much the Cornet muſt have, and conſequently the Lieutant, and Captain?*

IMagine the Cornet to have one'y 1 ſhare, it matters not what: then the Lieutenant muſt have 5 ſhares, wanting 3 Crowns; and the Captain muſt have 24 ſhares, wanting

ting 7 Crowns: Adde all theſe ſhares together, as here you ſee.

The Cornet 1 ſhare.
The Lieutenant 5 ſhares wanting 3 Crowns.
The Captain 24 ſhares wanting 7 Crowns.
The Sum is 30 ſhares wanting 10 Crowns.

This 30 ſhares wanting 10 Crowns ſhould be equal to 478: but being it is not, adde the 10 Crowns to 478, and it makes 488; which divide by 30 (the Sum of the ſhares) and the Quotient will be $16\frac{8}{15}$, or $\frac{4}{15}$, which is the Cornet's ſhare. Then the Lieutenant's will be $77\frac{20}{15}$, which is 5 times as much as the Cornet's, wanting 3 Crowns; and the Captain muſt have $377\frac{26}{15}$, which is 24 times the Cornet's ſhare, wanting 7 Crowns: And theſe three Sums added together, make $470\frac{120}{15}$; as in the Example.

The

The Cornet	$16\frac{4}{15}$
The Lieutenant	$77\frac{10}{15}$
The Captain	$377\frac{96}{15}$
The Sum	$470\frac{110}{15}$

The Fractions make up 8 ſhares, (which you may finde by dividing 120 by 15) which 8 being added to 470, maketh 478; the juſt Sum to be ſhared.

QUEST. 13.

A Drover driving of Sheep, one meets him, ſays, Good ſpeed friend with thy 20 *Sheep. Nay, ſays the Drover, I have not* 20 *Sheep; but had I as many more, and half as many more, and two Sheep, and half a Sheep, then I ſhould have*

have 20 *Sheep. How many Sheep had he in his Drove?*

Suppoſe he had 1 Sheep, then as many more is 1, and half as many more is half a Sheep; that is 2 and an half; and 2 Sheep and an half more; adde theſe together, thus:

1 Sheep.
1 as many more.
$\frac{1}{2}$ half as many more.
more $2\frac{1}{2}$ Sheep.

The Sum $2\frac{1}{2}$ more by $2\frac{1}{2}$.

This $2\frac{1}{2}$ more by $2\frac{1}{2}$ ſhould be equal to 20, but it is too little; wherefore, take $2\frac{1}{2}$ from 20, and there will remain $17\frac{1}{2}$; which $17\frac{1}{2}$ being divided by $2\frac{1}{2}$, produceth in the Quotient 7: wherefore he muſt have 7 Sheep in his Drove.

7 Sheep

7 Sheep.
7 as many more.
$3\frac{1}{2}$ half as many more
more $2\frac{1}{2}$ Sheep.

$17\frac{1}{2}$ more $2\frac{1}{2}$ is equal to 20, which was required.

QUEST. 14.

There is 273 l. *to be divided amongſt* 4 *perſons; namely,* Andrew, Bennet, Chriſtopher, *and* Daniel. Andrew *is to have a ſhare unknown:* Bennet *is to have twice as much as* Andrew, *and* 30 l. *more:* Chriſtopher *is to have* 3 *times as much as* Andrew, *wanting* 52 l. *And* Daniel *is to have* 5 *times as much as* Andrew, *and* 20 l. *more.*

How

How muſt this 273*l. be divided amongſt them, that every one have his true ſhare?*

Share

Suppoſe *Andrew* to have 1 for his part.

Then *Bennet* muſt have 2, and 30 *l.* over.

And *Chriſtopher* muſt have 3, lack 52 *l.*

And *Daniel* muſt have 5, and 20 *l.* over.

The ſum of the Shares is 11, lack 2 *l.*

The reaſon why I ſay 11 *ſhares wanting* 2 l. *is, becauſe* Bennet *and* Daniel *together have* 50 l. *over, and* Chriſtopher *wants* 50 l. *of* 3 *ſhares: therefore take their* 50 l. *from his* 52 l. *and there wants onely* 2 l.

Theſe 11 ſhares wanting 2 *l.* (by

the tenor of the Queſtion) ſhould be equal to 273: but becauſe 2 *l.* is wanting of eleven ſhares, therefore adde 2 *l.* to 273 *l.* and it will be 275 *l.* which theſe 11 ſhares ſhould be equal to; but being it is not, therefore divide 275 by 11, and the Quotient will be 25 *l.* for *Andrew*'s ſhare. Then,

	l.
Andrew's ſhare being----	25
Bennet's muſt be as much more, which is 50 *l.* and 30 *l.* more, in all----	80
And *Chriſtopher*'s ſhare muſt be three times as much as *Adrew*'s, that is 75 *l.* wanting 52 *l.* that is ----	23
And *Daniel*'s muſt be 5 times *Andrew*'s, which is 125 *l.* and 20 *l.* more, in all ----	145
The Sum of the ſhares ----	273

Which

Which is equal to the ſum to be divided, and is divided according to every punctilio of the Queſtion.

QUEST. 15.

A Maſter agrees with a Servant to work with him 30 *days, agreeing to give him for every day that he wrought* 7 s. *and for every day that he idled, the Servant was to abate* 5 s. *At the expiration of the* 30 *days, they come to an account, that the Maſter and Servant were both even, neither to receive any thing. How many days did the Servant work? and how many did he play?*

SUppoſe ID, for the days he laboured, comes to ---- —— 7 *s.*

Then he idled 29 days, which comes to ——————————145 *s.*

Now (becauſe the Money that his labour came to, and the Money that he loſt by neglect, came to the ſame) therefore adde 5 *s.* (which he was to allow every day he neglected) to both the above-ſuppoſed Numbers, and they make 12 and 150: therefore divide 150 by 12, and you ſhall have in the Quotient $12\frac{1}{2}$, and ſo many days he laboured; which being ſubſtracted from 30, the whole number of days, there remains $17\frac{1}{2}$, for the days he idled: for 12 days and an half, at 7 *s.* a day, comes to 4 *l*—7 *s*—6 *d.* alſo 17 days and an half which he idled, at 5 *s.* a day, comes to the ſame ſum; which declares the work to be true.

QUEST.

QUEST. 16.

A Dog is purſuing of a Hare, which is 100 *yards before him; and for every yard that the Hare runs, the Dog runs two yards and an half (that is, the Dog runs two times and an half ſwifter than the Hare.) I would know how many yards the Hare hath run when the Dog overtaketh her?*

PUt for the Yards (1 Y) (or any other Mark or Letter;) therefore the yards are (100 more 1 Y,) and becauſe the Dog runs twice and an half faſter than the Hare, take any two numbers in like proportion as $2\frac{1}{2}$ is to 1, which will be 5 and 2, (for 1 doubled makes 2, and $2\frac{1}{2}$ dou-

bl.d makes 5 :) theſe numbers thus found, there is the ſame proportion between (100 more 1 Y) to (1 Y) as there is between 5 and 2: Wherefore multiply (100 more 1 Y) by 2, the product is (200 more 2 Y) which is equal to (1 1 Y and 5 :) wherefore, if you ſubſtract 2 from 5, there will remain 3; and divide 200 by 3, the Quotient will be $66\frac{2}{3}$. Therefore I ſay, that the Hare will have run 66 yards and $\frac{2}{3}$ of a yard (which is 2 foot) when the Dog ſhall have overtaken her; and the Dog will have run $166\frac{2}{3}$ yards, which is twice and an half more than the Hare: for twice $69\frac{2}{3}$, and $33\frac{1}{3}$, which is half $66\frac{2}{3}$, is equal to $166\frac{2}{3}$, the quantity that the Dog ran.

QUEST.

QUEST. 17.

There are two Messengers set out from two Towns, which are 140 *miles asunder, upon one and the same day: The one travels* 8 *miles a day, and the other* 6 *miles. I demand how many days it will be ere they meet together.*

PUt one D (or day) for the time they shall meet; in which time the one would have travelled but 8 miles of the Journey, and the other but 6 miles; these added together, make but 14 miles; whereas they should have travelled 140 miles: Divide therefore 140 by 14, and the Quotient will be 10; so that in 10 days they will meet together: which may thus be proved.

He that travels 8 miles a day, will in 10 days have travelled 10 times 8 miles, that is 80 miles. And

He that travels but 6 miles a day, will in 10 days travel 6 times 10 miles, that is 60 miles.

These two Numbers, 60 and 80, being added together, make 140 miles, equal to the distance of the two Towns.

QUEST. 18.

A Footman goes a Journey, undertaking to go every day 9 miles: when he had been gone 10 *days, more expedition was required, and a Horseman is sent after him. How many miles in a day must the Horse-man ride to overtake the Foot-man in* 18 *days?*

FOr the miles that the Horse-man is to ride, suppose one part of the

the Journey, (or 1 M:) therefore in 18 days he would have travelled 18 M. Now for that the Foot-man travelling every day 9 miles, he went in 18 days 162 miles; to the which adde 90 miles, which he went in the 10 days that he ſet out before the Horſe-man, and the ſum is 252 miles. Now if you divide 252 by 18 M, you ſhall have in the Quotient 14: And ſo many miles muſt the Horſe-man travel in a day, to overtake the Foot-man in 18 days.——For if you multiply 18 by 14, the product will be 252, equal to the miles the Foot-man travelled in 28 days.

QUEST. 19.

One buys 100 *Turkeys for* 17 *pound, in the ſelling of which again, he loſeth* 18 *pound in his laying out of his* 102

pound. I would know how many Turkeys he ſold for one pound.

IMagine that he ſold one Turkey for one pound: then work by the Rule of Three, thus:

If 17 *l.* buy 100 Turkeys, how many will 102 *l.* buy?

Multiply 102 by 100, and the product will be 10200; which divide by 17, and the Quotient will be 600.

Then ſay again by the Rule of Three:

As 1 *l.* is to 1 T. ſo is 102 *l.* wanting 18 *l.* which he loſt, that is 84 *l.* to 84.

Here the determination of the Queſtion will be between 600, the firſt Quotient, and 84 the laſt Quotient.

Divide therefore 600 by 84, and the Quotient will be $7\frac{1}{7}$ T: and ſo many Turkeys he ſold for one pound.

It

It may thus be proved by the converſe working: For,

If $7\frac{1}{7}$ Turkeys coſt 1 *l.* what will 600 Turkeys coſt? Multiply and divide, you will finde 84 *l.* which is 18 *l.* leſs than 102 *l.* which he laid out.

QUEST. 20.

One bought 8 *yards of two ſorts of Stuff, as Calico, and Tammy, for* 20 s. *the Tammy coſt* 4 s. *a yard, and the Calico* 2 s. *How many yards did he buy of each ſort?*

TO anſwer this, or the like Queſtion, multiply 8 (the whole number of yards) by 2 (the leaſt price) it produceth 16; which ſubſtract from 20 (the whole price) the remainder will be 4: which divide by 2, (the difference of the price,) and the

Quo-

Quotient will be 2 for the number of yards of Tammy, and then there muſt be 6 yards of Calico. For,

2 Yards of Tammy at 4 *s.* is ——— 8 *s.*
And 6 Yards of Calico at 2 *s.* is ——— 12 *s.*

In all ——— 20 *s.*

QUESTION. 21.

There are four ſorts of Money, of which of one ſort 7 pieces makes a pound Sterling: Of the ſecond ſort, 18 pieces makes a pound: Of the third ſort 21 pieces makes a pound: And of the fourth ſort, 28 pieces makes a pound. Of each of theſe pieces, a Merchant received in exchange

a

a like number, all of them making 568 *pound Sterling. I demand how many pieces there were in all? and how much mony he had of each ſeveral piece?*

PUt (or imagine) 1 P, for the quantity of each ſeveral ſort of Money. Now becauſe to a pound Sterling there went 7 pieces of the firſt, apply your ſelf to the Rule of Three, in this manner, ſaying,

If 7 pieces of Money be worth 1 P

If 7 P be worth 1 *l.* what is 1 P worth? The anſwer will be, $\frac{1}{7}$ of a pound. Then again,

If 18 P be worth 1 *l.* what is 1 P worth? Anſwer, $\frac{1}{18}$ of a pound. Again for the third ſort,

If 21 P be worth 1 *l.* what 1 P? Anſwer, $\frac{1}{21}$ of a pound.

Laſtly, If 28 P be worth 1 *l.* what 1 P? Anſwer, $\frac{1}{28}$ of a pound.

Now theſe Fractions do make toge-

together $\frac{71}{2016}$, which ſhould be equal to 568. But ſeeing it is not, divide therefore 568 by $\frac{71}{2016}$, and you ſhall finde 2016, which is the value of 1 P: and ſo many of each of the pieces he was to receive, to make up his ſum of 568 *l.* Sterling; which may be eaſily thus proved.

	l.	*St.*
If 7 pieces are worth ——		1
What are 2016 worth? —	288	
If 18 pieces are worth ——		1
What are 2016 worth? —	112	
If 21 pieces are worth ——		1
What are 2016 worth —		96
If 28 pieces are worth ——		1
What are 2016 worth? —	72	

Here you ſee that *l.*

2016 of the firſt pieces make ----288
As many of the ſecond —— 112
As many of the third —— 96
And as many of the laſt —— 72

Which added together, make---568
Equal to the Money changed; and ſo is the Queſtion anſwered.

QUEST.

QUEST. 22.

There is an Army, whoſe Foot are 8 *times the number of the Horſe: Amongſt them there is* 392000 *Dollers to be diſtributed; ſo that each Horſeman is to have* 16 *Dollers, and each Foot-ſouldier* 5 *Dollers. I demand, Of how many Horſe and how many Foot the whole Army conſiſted?*

IMagine the Horſe-men to be one, or (1 H.)

And the Foot to be eight, or (8 F) becauſe they are (according to the Queſtion) to be 8 times as many as the Horſe. Now (becauſe each Horſe-man is to have 16 Dollers) multi-

multiply 16 by 1 H, and it makes 16 H: Likewiſe, becauſe each Foot-man is to have 5 Dollers, multiply 5 by 8 F, and it makes 40 F: adde 16 H and 40 F together, they make 56, which ſhould be equal to 392000 Dollers; but being it is not, divide 392000 by 56, and the Quotient will be 7000, for the number of Horſe-men; and that multiplied by 8, giveth 56000, for the number of Foot.

Now if you multiply 7000 by 16, the product will be 172000, for the number of Dollars to be diſtributed to the Horſe-men; and multiplying 56000 by 5, the product will be 280000 for the number of Dollers that the Foot-men are to have; and theſe two added together, make 392000, equal to the number of Dollers to be diſtributed, and anſwers the Queſtion in all its particulars.

QUEST.

QUEST. 23.

An Hegler goes to a Country-Market and buys 100 *Eggs, (which is* 120*) after the rate of* 3 *for a penny. At another Market he buys* 120 *more, at the rate of* 2 *for a penny; theſe Eggs he mingles together, and ſells his* 240 *Eggs at another Market, after the rate of* 5 *Eggs for two-pence. I demand, whether he loſt, gain'd, or ſaved by this Bargain.*

ACcording to common acceptation, any perſon unacquainted with Arithmetick, would conclude, that (beſides his Journeying from Market to Market) he loſt nothing, nor gained nothing. But by Arithmetical

tical proof, you ſhall finde that he loſt not only his Travel, but Money alſo.

For, by the common Rule of Three, you ſhall finde, That if 3 Eggs coſt one penny, 120 will coſt 3 *s*--4 *d*. for divide 120 Eggs by 3 Eggs, and there will be in the Quotient 40 pence, which is 3 *s*--4 *d*.

Likewiſe, by the ſame Rule, you ſhall finde, That 120 Eggs at 2 for a penny, will come to 5 *s*. for divide 120 by 2, and the Quotient will be 60 pence, or 5 *s*.

So that theſe two ſums, *viz*. 3 *s*. and 4 *d*. and 5 *s*. do make together 8 *s*. and 4 *d*. and ſo much did his 240 Eggs coſt him at both Markets.

But now to ſee whether he gained or loſt: Say by the ſame Rule of Three,

If 5 Eggs coſt 2 pence, what ſhall 240 coſt?

Multiply 240 by 2, it produceth 480; which divide by 5, and in the Quotient you ſhall finde 96 pence, which is but 8 ſhillings: ſo that beſides all his Travel, he loſt 4 pence in Money.

QUEST.

QUEST. 24.

One comes to a Draper, and demands the price of a yard of Canvas; the Draper demands 12 d. *Says the Chapman, I will willingly give you two ſhillings for every yard I buy of you; provided, that every Angel of my Money may go for twenty ſhillings: To which the Draper Aſſents.*

THis is rather a Falla.y than any thing elſe; but I have here inſerted it, to ſhew the cunning reach of ſome perſons, over the honeſt meaning of others.

The Draper and Chapman having thus agreed, the Chapman bids the Draper cut him off 5 yards, which at 2 *s.* the yard, comes to 10 *s.* The Chap-

Chapman throws him down an Angel, (which by their agreement was to go for twenty ſhillings) and demands the reſt again, which was ten ſhillings. So that by this reaching trick, he would have had his 5 yards of Canvas of the Draper for nothing.

QUEST. 25.

There are 100 *Stones which lie* 3 *foot or one yard upon the ground one from the other; and there is one employed to gather up theſe Stones one by one, and bring them to a Baſket which ſtandeth* 3 *foot from the firſt Stone. How many yards of ground muſt he go backwards and forwards*

wards in all, before he hath brought the laſt Stone to the Basket?

THe number of Stones being 100, and the Basket ſtanding one yard forward of the firſt Stone, makes in all 100 yards in length: wherefore to effect this,—— Adde 1 to the number of yards, it makes 101; which multiply by half the number of yards, which are 50, the product will be 5050: which ſhews that he muſt go forward 5050 yards: then muſt he go backwards as much, which is ten thouſand one hundred yards; which is 5 miles and three quarters, wanting only 20 yards.

QUEST.

QUEST. 26.

THE FISHER-MAN'S QUESTION.

I caught a Fiſh *(others among)*
Whoſe Head *was full five foot long,*
And his Tail *was (truly)*
As long as his Head *and half his* Body.
And his Body *(without fail)*
Was juſt as long as his head *and* tail.

This is my Queſtion,
Reſolve it who can;
How long was the Body,
And Fiſhes Tail *than?*

MUltiply the length of the Fiſh's Head by 3, by 4, and by 8; the one product ſhall be the leng'h

of the Tail, the other the length of the Body; and the third, ſhall be the length of the whole Fiſh.

So the Head being 5 foot, this multiplied by 3, giveth 15 foot for the length of the Tail.

Again, Multiply 5 by 4, it produceth 20, for the length of the Body.

And laſtly, Multiply 5 by 8, it produceth 40, for the length of the whole Fiſh; and exactly anſwers the *Queſtion* in all its particulars.

For the Head being 5 foot, and the Tail 15 foot, and the Body 20 foot;

The Tail 15 foot, is equal to the whole Head 5 foot, and half the Body 10 foot: for 5 and 10 is 15.

Adde the Body 20 foot, is equal to 15 foot the Tail, and 5 foot the Head.

And theſe together make 40 foot, the length of the whole Fiſh.

QUEST.

QUEST. 27.

There is a Steeple, the top whereof caſteth its ſhadow upon the ground 260 *foot from the bottom thereof: At the ſame time as you meaſure the ſhadow, the length of the ſhadow of your two-foot Rule is* 3 *foot: I demand how high this Steeple is.*

THis Queſtion is eaſily anſwered by the Rule of Three: But I here inſert it with ſome others, to ſhew how ſerviceable Numbers, and the right underſtanding of them, are applicable to all ſorts of men and things. To effect this, this is the proportion.

As the length of the ſhadow of your

your Rule 3 foot, is to the length thereof 2 foot:

So is the length of the ſhadow of the Steeple 260 foot, to the height of the Steeple $86\frac{2}{3}$.

Wherefore, multiply 260 foot, the length of the ſhadow of the Steeple, by 2 foot, the length of your Rule, and the product is 520 foot; which divide by 3, the length of the ſhadow of your Rule, and the Quotient will be $86\frac{2}{3}$, that is, 86 foot and two third parts of a foot, which is 8 inches; ſo that the Steeple is 86 foot, and 8 inches high.

QUEST. 28.

There is a Fountain which hath 4 Streams: in the Ciſtern whereof there is contained 8 barrels of Water; if the leaſt of the ſtreams be onely opened, the

Water will be 6 hours in running out: if the ſecond, it will be 4 hours running out: If the third be opened, it will be 3 hours running out: and if the fourth and greateſt be ſet running, it will run the Water out in 2 hours. I would know in what time all the Water would run out if all the 4 ſtreames were ſet running together?

BEcauſe the leaſt Stream will vent all the Water in 6 hours, it muſt therefore vent 8 Barrels in 6 hours; and the ſecond Stream would run 12 Barrels, the third 16 Barrēls, and the biggeſt 24 Barrels.

Leaſt Stream —— 8
Second —— 12
Third —— 16
Biggeſt —— 24
In all — 60

Then

Then ſay by the Rule of Three,

If 60 require 6, what will 8 require?

Multiply 6 by 8, it produceth 48, which ſhould be divided by 60; but it being above 48, it is therefore $\frac{48}{60}$, or $\frac{4}{5}$ of an hour.

And in that time will all the Water run out of the Fountain, if all the 4 Streams were ſet running together.

QUEST. 29.

A man dying, leaves his Wife with Childe of her firſt; and by Will bequeathed his Eſtate, which amounted to 2600 l. *conditionally thus, That if the Childe his Wife went withal were a Woman-kinde, that then his Wife ſhould have two thirds thereof, and the*

Childe the other third: But if ſhe ſhould be delivered of a man-Childe, then the Childe was to have two thirds, and his Wife the other third. But after the Deceaſe of the Father, the Mother was delivered of two Sons and a Daughter. In what nature ſhall this Eſtate be parted amongſt them, according to the Teſtator's will?

IT is evident, by the Will of the Deceaſed, that for every Third that the Daughter was to have, the Mother was to have two Thirds: And that the Son was to have double to the Mother.

Obſerving this order; if you allow to the Daughter 1 *l.* then the Mother muſt have 2 *l.* and either of the Sons muſt have twice as much as the Mother, that is 4 *l.* apiece.

Where-

Wherefore for the two Sons put down 4 *l.* and 4 *l.* for the Mother 2 *l.* and for the Daughter 1 *l.* in this order:

	l.
The two Sons	4
	4
The Mother	2
The Daughter	1
The Sum	11

Then ſay by the Rule of Three direct,

If 11 *l.* the Sum of all the portions, requires 2600 *l.* what ſhall 4 *l.* (which is one of the Sons ſhares) require?

Multiply 2600 by 4, the product will be 10400, which divided by 11, the Quotient will be 945 *l.* $\frac{5}{11}$, for one of the Sons ſhares: So then the other Son muſt have as much; and

the Mother half as much; namely, $472\frac{8}{11}$: and the Daughter muſt have half as much as the Mother, namely, $236\frac{4}{11}$; all which being added together, make 2600*l.* equal to the whole Eſtate; and anſwers the Will of the Teſtator in all particulars.

The two Sons	$945\frac{7}{11}$
	$945\frac{7}{11}$
The Mother —	$472\frac{8}{11}$
The Daughter---	$236\frac{4}{11}$
———	$2600\frac{22}{11}$

QUEST. 30.

The Grand-father, the Father, and the Son met together, and ſpent 20*s. When the Reckoning came to be paid, the Grand-father would pay one Half, the Father one Third, and the Son one Quarter.*

How

How much muſt every one pay of this Reckoning?

TO reſolve this, If the Grand-father ſhould pay $\frac{1}{2}$, which is 10 *s.* and the Father $\frac{1}{3}$, which is 6 *s.*--8 *d.* and the Son $\frac{1}{4}$, which is 5 *s.* the Reckoning would be over-paid: for theſe three added together, make 21 *s.* 8 *d.* and they ſhould pay but 20 *s.*

Wherefore you muſt work otherwiſe; as thus: Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, into one denomination, by multiplying the denominators one into another; ſaying, 2 times 3 is 6, and 4 times 6 is 24, which 24 is a new denominator. Then the $\frac{1}{2}$ of 24 is 12: and $\frac{1}{3}$ of 24 is 8: and $\frac{1}{4}$ of 24 is 6; the ſum of them is 26. —— And this 26 is your firſt number in the Rule of Three: —— 20 *s.* (which they ſpend) muſt be the ſecond number; ---And 12, 8, and 6 muſt be the three third Numbers: —— Wherefore ſay,

1. *If* 26 *pay* 20 *s.* *what muſt* 12 *pay?*

Multiply 20 by 12, it produceth 240; this divided by 26, giveth in the Quotient 9 *s.* $\frac{6}{13}$ for the Grand-father's part.

II. *If* 26 *pay* 20 *s. what muſt* 8 *pay?*

Multiply 20 by 8, the product is 160; which divide by 26, and the Quotient will be 6 *s.* $\frac{12}{13}$: and ſo much muſt the Father pay.

III. *If* 26 *pay* 20 *s. what muſt* 6 *pay?*

Multiply 20 by 6, it giveth 120; which divided by 26, gives in the Quotient 4 *s.* $\frac{16}{13}$: and ſo much muſt the Son pay.

The Grand-father muſt pay 9 $\frac{6}{13}$,

	s.	*d.*	*q.*
Equal to ——	9	2	3

The Father muſt pay ——— 6 $\frac{6}{13}$,

Equal to —	6	1	3

The Son muſt pay ——— 4 $\frac{1}{13}$,

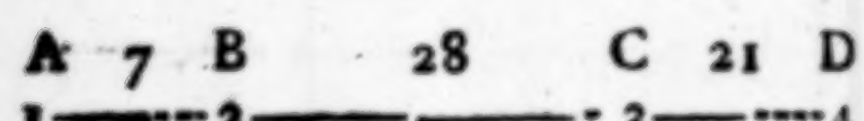
Equal to —	4	7	2
In all —	20	0	0

QUEST.

QUEST. 31.

There are four Cities or Towns lying one from the other in a right Line; and the two farthermoſt are diſtant one from the other 56 *miles: and the diſtance from the third to the fourth, is as much as from the firſt to the ſecond, with half as much as between the ſecond and the third: And the diſtance between the ſecond and third is as much as the diſtance between the firſt and ſecond, with the third and fourth together. How far were each of the Towns diſtant one from the other?*

LEt the Four Cities or Towns be A B C D.



Becauſe the diſtance between the Third and Fourth, with the diſtance between the Firſt and Second, is equal to the diſtance between the Second and Third: Therefore divide 56 (the whole diſtance) by 8, and the Quotient will be 7; wherefore the diſtance between the firſt and ſecond Town is 7 miles.

Again, it is evident, that the diſtance between the third and fourth muſt be three times as far, that is 21 miles. And the diſtance between the ſecond and third being equal to both them, muſt be 28 miles.

So is C D diſtant as far as A B and half B C.
And B C is diſtant as far as A B and C D together.
And A D is diſtant 56 miles.

QUEST.

QUEST. 32.

Two Ships *ſet ſail at one time; the one ſails directly East, 74 Leagues: The other ſails directly North, 62 Leagues: I would know how many Leagues theſe two* Ships *are aſunder.*

Multiply 74 by 74, and the product will be---	5476
Alſo Multiply 62 by 62, the product is ———————	3844
Theſe two Numbers added together, make ———————	9320

Of this Number 9320, extract the ſquare Root, and you ſhall finde it to be almoſt 97: And ſo many Leagues are the two Ships aſunder.

QUEST.

QUEST. 33.

There was a May-pole, which in a windy night was broken, ſo that the top thereof lit upon the ground 30 *foot diſtant from the bottom thereof; and the piece which was broken off was* 50 *foot long: At what length was the May-pole broken off, and how high was it in all?*

Multiply 50 (the length of the piece broken off) in it ſelf; that is, Multiply 50 by 50, it makes 2500. Likewiſe multiply 30 (the diſtance which it fell from the bottom) by 30, the product is 900; ſubſtract 900 from 2500, and there remains 1600: Extract the ſquare Root of 1600, and you will finde it to be 40; ſo that there

there is 40 foot of the May-pole ſtanding; and 50 being broken off, makes 90; ſo that the May-pole was 90 foot high.

QUEST. 34.

There is 160 l. *to be diſtributed amongſt a number of poor people; ſome are to have Shillings, ſome Six pences, ſome Groats, and ſome Three-pences: How many poor People will this relieve, ſo that the number of thoſe that receive Shillings, Six-pences, Groats, and Three-pences, ſhall be equal?*

TO effect this, reduce the 160 *l.* into pence; it maketh 38400 pence for your dividend. Then adde 12 *d.* 6 *d.* 4 *d.* and 3 *d.* together

ther, they make 25 *d.* and this is your Diviſor.

Then divide 38400 (the pence in 160 *l.*) by 25 (the ſum of the ſhares) and in the Quotient you ſhall finde 1536; and ſo many poor People muſt there be of a ſort; which you may eaſily thus prove: For,

			l.	*s.*	*d.*
1536	Shillings ——	is	76	16	0
	Six-pences ---		38	08	0
	Groats ——--		25	12	0
	Three-pences		19	04	0
		In all —	160	00	0

Now if you would know how many Poor there were in all, multiply 1536 by 4, and the Quotient will be 6144; and ſo many poor People muſt there be in all to receive this Legacy.

QUEST.

QUEST. 35.

How many perſons will there be required to receive 2880 *Pence, ſome receiving* 6 d. *ſome* 5 d. *ſome* 4 d. *ſome* 3 d. *ſome* 2 d. *ſome* 1 d. *there being a like number of each ſort?*

IF you adde 6 *d.* 5 *d.* 4 *d.* 3 *d.* 2 *d.* and 1 *d.* together, they make 21 *d.* by which, if you divide 2880, the Quotient will be 137 $\frac{3}{7}$ and ſo many perſons muſt there be of a kinde: which is thus proved:

For,

			l.	*s.*	*d.*
137	Six-pences	is	3	8	6
	Five-pences		2	17	1
	Groats		2	5	8
	Three-pences		1	14	3
	Two-pences		1	2	10
	Pence		0	11	5
	In all		11	19	9

This

This 11 *l.*- 19 *s.*- 9 *d.* ſhould have been 12 *l.* equal to 2880 pence; but by the former work you ſee that when you divide 2880 by 21, there remained $\frac{7}{21}$, or $\frac{1}{3}$ (which is all one:) now this $\frac{7}{21}$ becomes to be $\frac{21}{3}$ of a penny, which is equal to 3 *d.* wherefore if you adde 3 *d.* to 11 *l.* 19 *s.* 9 *d* the ſum will then be 12 *l.* or 2880 *d.*

QUEST. 36.

There are 1000 *Loaves of Bread to be divided amongſt three ſorts of perſons; thoſe that were above* 40 *years of age, were to have* 12 *penny Loaves, thoſe above* 20 *years of age, were to have* 6 *penny Loaves, and thoſe above* 10 *years of age were to have penny Loaves. How many* 12 *penny Loaves, how*

how many 6 penny, and how many penny Loaves muſt there be provided?

THe Exceſs is $\left\{\begin{matrix}40\\20\\10\end{matrix}\right\}$ the $\left\{\begin{matrix}1\\2\\3\end{matrix}\right\}$ ſort of perſons

The ſum ---70

By the Rule of three ſay,

(1) *If* 70 *require* 1000, *what ſhall* 40?

Multiply 1000 by 40, it produceth 40000; which divide by 70, the Quotient will be 571$\frac{3}{7}$, and ſo many 12 penny loaves muſt be provided.

(2) *If* 70 *require* 1000, *what ſhall* 20?

Multiply 1000 by 20, it produceth 20000; that divided by 70, produceth 285$\frac{5}{7}$, ſo many 6 penny loaves.

(3) *If* 70 *require* 1000, *what ſhall* 10?

Multiply 1000 by 10, it produceth

ceth 10000; this divided by 70 produceth $142\frac{6}{7}$, and so many penny loaves must be provided: which added together, (the Fraction-parts excepted) make 1000 loaves.

QUEST. 37.

A Debtor owes his Creditor a certain sum of Money, of which, because he cannot make one entire payment, he condescends to pay it by the weeks in the year, according to this progression, namely, to pay the first week 5 s. *the second week* 10 s. *the third week* 15 s, &c. *I would know how much the Creditor received of his Debtor at the years end.*

TO perform this easily (for to adde 5*s*. 10*s*. 15*s*. 20*s*. till you

you come to the end of the 52 weeks, which make a year, would be tedious) do thus;

First, multiply 52 (the number of weeks in the year) by 5 (the increaſe every week) the product will be 260, which is equal to the two and fiftieth number, if you had added the ſums together.

Secondly, to this 260, adde 5 (the increaſe for one week) it maketh 265, which multiply by 26 (half the number of weeks in the year) and it produceth 6890 ſhillings, which is 344*l.* 10*s.* and ſo much will the Creditor have received of his Debtor at the years end.

QUEST. 38.

A certain perſon by Will, bequeaths his Eſtate to his Executor, enjoyning him every year (ſo long as the Executor lived)

to

to beſtow on certain charitable uſes by him named, a certain ſum of Money encreaſing every year 55 l. *more than the preceding; ſo the firſt year the Executor expended* 55 l. *and the laſt year* 495 l. *How many years lived the Executor after the Donor? and how much to the fore-mentioned Uſes did he expend?*

TO effect this eaſily, Firſt, Subſtract 55 *l.* (the firſt disburſment) from 495 *l.* (the laſt diſburſment) the remainer is 440 *l.* which divide by 55 (the Exceſs or increaſe of every years disburſment) and the Quotient will be 8, to which adde 1, and it makes 9; and ſo many years lived the Executor after the Deceaſed.

Secondly, Multiply 55 (the Exceſs) by 9 (the number of years) the

the Quotient will be 495, which was the laſt diſburſment.

Thirdly, Adde 495 and 55 together, they make 550, which multiply by $4\frac{1}{2}$ (which is half the number of years the Executor lived) and the product will be 2475; and ſo much did the Executor expend in all.

QUEST. 39.

A Father gave to his Eldeſt Son 252 l. *and to his Youngeſt he gave but* 28 l. *and to every Son ſucceſſively from the Youngeſt he gave* 28 l. *more than to the other. How many Sons had the Father? and how much Money did all their Legacies amount to?*

FIrſt take 28 (the Youngeſt Son's ſhare) from 252 (the Eldeſt Son's ſhare) the remainer will be 224, which

which divide alſo by 28 (becauſe every Son's portion exceeded others by 28 *l.*) and the Quotient will be 8, to which adde 1, (for the firſt ſon) and it makes 9; ſo that he had 9 ſons.

Now to finde what ſum of Money all their Legacies amounted unto; adde 28 (the youngeſt ſon's ſhare) to 252 (the eldeſt ſon's ſhare) and the ſum will be 280; which being divided by $4\frac{1}{2}$ (which is half the number of the ſons he had) the product will be 1260 *l.* and ſo much Money did all their Portions amount unto.

QUEST. 40.

A Biſhop dying, left 10000 l. *to be diſtributed amongſt three ſorts of men,* viz. *Divines, Lawyers, and Phyſicians, in ſuch order, that* 40 *Divines were*

were to have 10 l. *the Lawyers* 5 l. *the Phyſicians* 1 l. *And* 60 *Phyſicians were to have their parts out of the Legacy alſo. I would know what the Divines, Lawyers, and Phyſicians ſhare will be? And alſo what will the Portion or ſhare of every Divine, Lawyer, and Phyſician be?*

FIrſt, Multiply 40 (the Divines) by their Exceſs (which is 10 *l.*) and it produceth 400.

Secondly, Multiply the 50 Lawyers by 5 (which is their Exceſs) and it produceth 250.

Thirdly, Adde theſe two numbers together, *viz.* 400, and 250, and they make 650, which with the 60 Phyſicians make 710, the total, as here you ſee;

Divines

Divines	400
Lawyers	250
Phyſicians	60
In all	710

Being thus prepared, ſay by the Rule of Three direct thus:

If 710 perſons have 10000 *l.* amongſt them, how much ſhall 400 perſons have?

Firſt, For the Divines,

Multiply 10000 by 400, it produceth 4000000; which divide by 710, and the Quotient will be 5633 *l.* and $\frac{57}{71}$ of a pound; ſo that the 140 Divines ſhares will come to $5633\frac{57}{71}$ *l.*

Secondly, For the Lawyers.

Multiply 10000 by 250, the product will be 2500000; which divide by 710, and the Quotient will be 3591 *l.* and $\frac{9}{71}$ of a pound; ſo that the 250 Lawyers will have $3591\frac{9}{71}$ *l.* for their ſhares.

Thirdly,

Thirdly, For the Phyſicians.

Multiply 10000 by 60, the product will be 600000; which divide by 710, and the Quotient will be 845 and $\frac{5}{71}$ of a pound. So that the 60 Phyſicians will have for their ſhares $845\frac{5}{71}$ *l.* All which ſhares being added together, do make up the juſt ſum of 10000 *l.* As here you ſee.

400 Divines —	$5633\frac{57}{71}$
250 Lawyers —	$3521\frac{9}{71}$
60 Phyſicians —	$845\frac{5}{71}$
	10000

Having thus found the general ſhares, it will be now requiſite to finde every particular ſhare: and Firſt, *For every Divines ſhare, ſay,*

If 40 Divines have $5633\frac{57}{71}$ *l.* what ſhall one have?

Divide $5633\frac{57}{71}$ *l.* which is 5633 *l.*-16 *s.*-0-2 *q.*-$\frac{50}{71}$. by 40, the Quotient will be 140 *l.*-16 *s.*-0 3 *q.*-$\frac{10}{71}$. for every Divines ſhare.

Secondly, *For every Lawyers ſhare.*

Divide $3521\frac{2}{71}$, which is 3521 *l.* –2 *s.*–6 *d.*–1 *q.* $\frac{42}{71}$, by 50, the Quotient will be 70 *l.*–8 *s.*–5 *d.*–1 *q.* $\frac{46}{71}$. for every Lawyers ſhare.

Thirdly, *For every Phyſicians ſhare.*

Divide $845\frac{1}{71}$, which is 845 *l.* –1 *s.*–4 *d.*–3 *q.* $\frac{41}{71}$, by 60, the Quotient will be 14 *l.*–1 *s.*–8 *d.*–1 *q.* $\frac{1}{71}$, for every Phyſicians ſhare.

QUEST. 41.

There are two Cities, which are diſtant 500 *Miles, and there are two other Cities lying between them: Now from the firſt City to the ſecond the diſtance is not known; but from the ſecond to the third it is* 6 *times as far as from the firſt to the ſecond, and* 15 *Miles more. And from the third*

third City to the fourth it is 9 times as far as from the second to the third wanting 16 Miles. How far are these 4 Cities one from the other?

LEt the 4 Cities be represented by these 4 Letters A, B, C, D. and that from A to D it is 500 miles.

Then suppose, that from A to B it be 1 mile, then from B to C it must be 6 miles, and 23 miles more. Then again, from C to D it must be 9 times as much as from B to C, which is 54 miles wanting 16. Set the numbers as here is done:

from { A to B, is 1 mile.
B to C, is 6 miles, more 23.
C to D, is 54 miles wanting 16.

61 miles, 23 miles, want 16 miles.

Adde all together as you see here is

done, and you ſhall finde the ſum to be 61 miles, more 23 miles, leſs 16 miles, which ſhould be 500 miles.

Now (becauſe there is more 23 miles, and leſs 16 miles,) ſubſtract 16 from 23, and there will remain 7; which 7 ſubſtract from 500, and the remainer will be 493; which divide by 61, and the Quotient will be $8\frac{5}{61}$, and that is the diſtance from the Town A to the Town B.

Then from *miles*
A to B being —— $8\frac{5}{61}$, from
B to C muſt be-- $48\frac{30}{61}$ more 23& from
C to D muſt be $432\frac{279}{61}$ want 16.

All which ſums being added together, and the Fractions reduced, the ſum of miles will be 500, as by the work underneath doth appear.

From { A to B is $8\frac{5}{61}$.
B to C is $48\frac{15}{61}$ more 23
C to D is $432\frac{270}{61}$ want 16

Subſtract 16 from 23, reſts —— 7

The

The ſum of the Denominators of the Fractions is 305, which divided by 61, the Quotient is-- ——— 5

All theſe ſums 8, 48, 432, 7, and 5, added together, make 500, equal to the diſtance between A and D, and proves the work to be true.

QUEST. 42.

There is 400 *Crowns to be diſtributed among* 5 *perſons,* A, B, C, D, E, *in this wiſe.* A *muſt have an unknown ſhare;* B *muſt have* 3 *times as many as* A, *and* 6 *more:* C *muſt have* 9 *times as many as* A, *and* 3 *times as many as* B *wanting* 9. D *muſt have three times as many as* B,

4 times as many as C, *2 times as many as* A, *and* 8 *over: And* E *muſt have* 2 *times as many as* C, 3 *times as many as* B, *and* 4 *times as many as* A, *wanting* 11. *How many muſt each perſon have?*

SUppoſe (as in the laſt Queſtion) A to have 1 Crown, then B muſt have 3 Crowns and 6 more, and the reſt as in this following Collection.

A	1			
B	3	more 6		
C	18	more 18	wanting	9
D	93	more 128	want	36
E	49	more 54	want	29
All---	169	more 206	want	74

Subſtract 74 from 206, and there will remain 132; which 132 ſubſtract from 400, there will remain 268; which 268 divide by 169, and the

the Quotient will be $1\frac{22}{1689}$, which will be the ſhare of A, which is 1 Crown, and 586 parts of a Crown divided into 1000 parts; and all the reſt of the ſhares will be (in Decimal Fractions) as followeth,

	Crowns 1000 *Parts.*
A	1. 586
B	10. 758
C	37. 548
D	247. 428
E	102. 714
Sum	400. 034

Theſe are the ſeveral ſhares, and you ſee the ſum of them is juſt 400, onely there is in the Fraction 34 of a thouſand parts too much; which is occaſioned becauſe 586 parts is ſomewhat more than $\frac{22}{1689}$.

QUEST. 43.

There is 100 l. *left to be divided among* 3 *perſons*, A, B, *and* C, *of which* A *is to have one third*; B *two ſeventhſ*; *and* C *five eighths. How much muſt each perſon have?*

	l.	*s.*	*d.*
$\frac{1}{3}$ of 100 *l.* is ——	33	6	8
$\frac{2}{7}$ of 100 *l.* is ——	28	11	5 $\frac{1}{3}$
$\frac{5}{8}$ of 100 *l.* is ——	62	10	0
The Sum —	124	8	1 $\frac{1}{3}$.

If the Dividend ſhould be thus made, the Executor which pays the Money would loſe 24 *l.*-8 *s.*-1 *d.*-$\frac{1}{3}$. for his paying of the Money, and yet every ſingle perſon would imagine he had but his due. Wherefore to avoid

void ſuch deceits, work thus in this and the like caſes:

Multiply the Denominators of the Fractions into each other, thus, ſaying, 3 times 7 is 21, and 8 times 21 is 168.

Then divide 168 by each ſeveral Denominator, ſo 168 divided by 3 produceth 56, and divided by 7 it produceth 48, and divided by 8 it produceth 105; the 3 Quotients added together, make 209.

See the Work.

A	$\frac{1}{3}$		56
B	$\frac{2}{7}$	of 168 is	48
C	$\frac{5}{8}$		105
	168		209

Then work by the Golden Rule, ſaying,

As 209 is { 56, 48, 105 } to 100, ſo is { 26 — $\frac{146}{209}$, 22 — $\frac{102}{209}$, 50 — $\frac{50}{209}$ }

The Fractions reduced make compleat pounds } -2

The ſum —— 100

So that		*l.*	*s.*	*d.*
A	must have	26	12	2
B	must have	22	11	4
C	must have	50	16	6
	In all	100	00	0

And in this manner may you resolve all Questions of this kinde.

QUEST. 44.

There is a Grand-father which is aged 125 *years; his Son hath a Wife and* 3 *Sons: Now the Father is as old as his Wife and his second Son, and* 4 *years over. The Wife is as old as all her* 3 *Sons, and* 3 *years over. The Eldest Son is as old as his two Brothers, and* 2 *over. The second Son is*

is 4 times the age of the Youngeſt, and 1 year over. And all theſe Ages together, are equal to the Age of the Grandfather, namely 125 years. Now I would know how old was the Father, Mother, and all the 3 Sons ſeverally.

YOu muſt, as in former Examples of this kinde, imagine an age for the youngeſt Son, which we will ſuppoſe to be 1 year; then will the age of the Father, Mother, and the other ſons (according to the Tenor of the Queſtion) be as followeth, *viz*,

Young ſt ſon--1 year
Second ſon----4 years, more 1
Eldeſt ſon —— 5 years, more 3
Mother - —— 10 years, more 3
Father —— 14 years, more 4

The ſum

This 34 years more 11, ſhould be equal to 125 the Grand-father's age, but it is not; wherefore from 125 ſubſtract 11, and the remainer will be 114 years; which divide by 34, and the Quotient will be $3\frac{12}{34}$, or (in leſſer terms) $3\frac{6}{17}$ for the age of the Youngeſt ſon, and then the reſt will be,

Youngeſt ſon, years--	3	$\frac{6}{17}$
Second ſon ----	12	$\frac{24}{17}$
	1	
Eldeſt ſon ----	15	$\frac{30}{17}$
	3	
The Mother-----	30	$\frac{60}{17}$
	3	
The Father-----	42	$\frac{84}{17}$
	4	
The Fractions reduced make---	12	

The ſum of all----125 equal to the age of the Grand-father, and the Queſtion truly reſolved.

QUEST.

QUEST. 45.

What whole number is that, which if you divide it by 9 *there ſhall remain* 8, *divide it by* 8 *there ſhall remain* 7, *divide it by* 7 *there ſhall remain* 6; *and ſo on till you divide it by* 2, *and then there ſhall remain One.*

THe Numbers which have this property are many, and may be found by the continual multiplying of a number through all the 9 Digits, and adding the preceding Digit to the laſt product, as in the following Scheme. Firſt, ſet down all the 9 Digits orderly one under another, and againſt 1 ſet a Cypher; then under 1 ſet 2, and adde 1 and 2 together, they make

1	0
2	3
3	11
4	47
5	239
6	1439
7	10079
8	80639
9	725759

make 3; which ſet under 0, and againſt 2. Then ſay, 3 times 3 is 9, and 2 over 3 is 11; ſet 11 by 3: then ſay, 4 times 11 is 44, and 3 over 4 is 47; ſet 47 againſt 4: and thus continuing, you ſhall finde 725759 to ſtand againſt 9, and that number is capable of all theſe diviſions, and the remainder ſhall always be one Unite leſs than the Diviſor.

There are infinite other Numbers will be found to have the ſame property, as namely theſe following, of which 2519 is the leaſt.

	2	5	1	9
	5	0	3	9
	7	5	5	9
1	0	0	7	9
1	2	5	9	9
1	5	1	1	9
1	7	6	3	9
2	0	1	5	9
2	2	6	7	9
2	5	1	9	9

QUEST. 46.

How many Stroaks doth a Clock ſtrike in 12 *hours, all the Stroaks being added together?*

THis is eaſie enough to be done: for if you adde 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. and 12, all into one ſum, you ſhall finde that ſum to be:

78; and ſo many Stroaks doth the Clock ſtrike in all.

But more artificially thus: The hours being 12, take half thereof, which is 6, and that keep; then 12 being the greateſt number, and 1 the leaſt, adde them together, they make 13: wherefore multiply 13 by 6, and the product is 78; and that is your number ſought, and ſo many Stroaks doth the Clock ſtrike in 12 hours.

QUEST. 47.

If a man ſhould ſell a Horſe for a penny a Nail for every Nail in his 4 *ſhoes, which are* 28, *according to this rate; for the firſt Nail* 2 d. *for the ſecond* 4 d. *for the third* 6 d. *and ſo on increaſing* 2 d. *every Nail till the* 28 *Nails were*

were out: How much money ſhould he receive for his Horſe?

THis Queſtion may be reſolved by the continual addition of 2 *d.* 4 *d.* 6 *d.* &c. till you come to the 28*th* Nail, which will be 56 *d.* and then adde all the ſums together, which done, they will make 812 *d.* but this way is tedious. Therefore,

More artificially thus: the laſt Nail (or greateſt number) is 56 *d.* and the firſt Nail (or leaſt number) is 2 *d.* adde theſe two numbers together, and they make 58; which multiply by 14, (the half number of the Nails) the product will be 812 *d.* And ſo much Money ſhall he receive for his Horſe, which is 3 *l.*-7 *s.*-8 *d.* And in this manner may you reſolve all Queſtions of this nature.

QUEST.

QUEST. 48.

A Traveller goes a Journey, and goes every day 8 miles. At the ſame time another Traveller goes the ſame Journey, and goes the firſt day 1 mile, the ſecond day 2 miles, the third day 3 miles, &c. I would know in how many days the ſecond Traveller will overtake the firſt, that went 8 miles a day?

EIght, which is the number of Miles that the firſt Traveller goeth in a day, is the middle, or half term, in the Progreſſion: wherefore double 8, and it makes 16; from which take 1, (the numb r of miles that the ſecond Traveller went his fi ſt day) and there will remain 15;

and

and in ſo many days will the ſecond Traveller have overtaken the firſt, they having then travelled 120 Miles.

QUEST. 49.

A Boy getting into an Hen-rooſt, ſtole from thence a certain number of Eggs. Another Boy diſcovering him, he to ſatisfie him, gave him half the Eggs which he Stole, but he gave him back 12. *Then a ſecond Boy accuſes him, and he to appeaſe him, gives him half his Eggs remaining, who returns him* 7. *And meeting with a third accuſer, he gives him half his Eggs remaining, who gives him back* 4. *And when he was clear of all his accuſers, he had*

had ſtill 20 *Eggs remaining. How many Eggs did the Boy ſteal at firſt?*

TO reſolve this or the like, you muſt from the 20 which he had left, ſubſtract 4, (which his laſt accuſer returns him) and there will remain 16; which double, and there will be 32; from which take 7, there will remain 25; which doubled, makes 50; from which take 12, and the remainer will be 38, of which the double is 76, and that is the number of Eggs that he firſt ſtole.

QUEST. 50.

A Young Scholar being come to a Country-Town, where he intended to reſide ſome time, lit into a Gentlemans Houſe, where there were in Family the

the Maſter, Miſtriſs, and 4 Children, which with himſelf made 7. At Dinner they diſcourſed concerning the Scholar's Board there for a year, for which the Gentleman demanded a certain ſum; which the Scholar thinking too much, made this overture, that he would give him ſo much as he did demand of him for a year, provided for that ſame Money he ſhould have his board ſo long time as he could daily place thoſe 7 perſons at the Table in a ſeveral and diſtinct order, ſo that they ſhould never all of them ſit in the ſame places as then they did. The Gentleman condeſcends. The Queſtion is, How many days may the Scholar ſojourn with the Gentleman before

all

all theſe Changes come about?

TO effect this, you muſt ſtill multiply your preceding Product by the Figure following. Thus, at the firſt day, the perſons ſate at the table as then they did; the ſecond day multiplying 1 by 2, it makes 2, and ſo 2 changes may be made of two perſons, in this manner: 1, 2. 2, 1. Then multiply this Figure by the next day, or 3, and it makes 6; which ſhews that 6 changes may be made of 3 perſons; as thus, 1, 2, 3. 1, 3, 2. 2, 1, 3. 2, 3, 1. 3, 1, 2. 3, 2, 1. Then multiply this number 6 by the next Figure 4, it makes 24 changes; this multiplied by 5, makes 120; that multiplied by 6, makes

1) 1
2) 2
3) 6
4) 24
5) 120
6) 720
7) 5040

2
49
343
2401
5040(13
3655
36

makes 720; and that 720 multiplied by 7, makes 5040 Changes. So that the Scholar (according to the tenour of this Bargain) might ſojourn there 5040 days; which being divided by 365, the number of days in the year, the Quotient is 13 years and 295 days; which is 14 years wanting only 70 days.

QUEST. 51.

Three Butchers do buy together a parcel of Sheep, which will coſt them 72 l. *Now they do agree together that the ſecond ſhall pay of the Money one third part more than the firſt: And that the third ſhall pay a fourth part more than the ſecond.*

ſecond. How much muſt each Butcher pay of that ſum?

IMagine that the firſt Butcher was to pay of the ſum 3 *l.* then the ſecond muſt pay 4 *l.* which is one third part more than the firſt. Laſtly, The third Butcher muſt pay 5 *l.* being one quarter or fourth part more than the ſecond. Theſe three ſums, 3 *l.* 4 *l.* and 5 *l.* make but 12 *l.* whereas it ſhould be 72 *l.* Wherefore ſay by the Rule of Three,

If 12 *l.* come of 3 *l.* of what 72 *l.*

Multiply 72 by 3, and the product will be 216; which divide by 12, and the Quotient will be 18: and ſo much of the Money muſt the firſt Butcher pay; then the ſecond muſt pay 24 *l.* and the third muſt pay 30 *l.* all which ſums do make 72 *l.* and the Queſtion is anſwered.

QUEST.

QUEST. 52.

A Man and his Wife did uſually drink out a certain Veſſel of Beer in 12 *days, and the Husband found by often experience, that in his Wifes abſence he could drink it off in* 20 *days. The Queſtion is, In how many days the Wife could drink it off alone?*

FRom 20 (the number of days in which the Husband drank off the Veſſel) ſubſtract 12, (the number of days in which they both drank it off in) and the remainder will be 8. Then by the Golden Rule ſay,

As 8 days to 12 days, ſo 20 days to what?

Multiply 20 by 12, and thereof will

come 240, which divided by 8, the Quotient will be 30; and in ſo many days would the Wife have drank it off alone.

QUEST. 53.

If 3 pair of Gloves be equal in value to 2 pieces of Ribbon; 3 pieces of Ribbon to 7 douzen of Points; 6 douzen of Points to 2 yards of Lace; 3 yards of Lace to 81 ſhillings. How many pair of Gloves may be bought for 28 ſhillings?

FIrſt, Multiply 3 pair of Gloves by 3 pieces of Ribbon, they make 9, which multiply by 6 doren of Points, it produceth 54, that multiplied by 3 yards of Lace, produceth 162,

162, and that multiplied by 28 ſhillings, produceth 4536 for the Dividend.

Secondly, Multiply 2 pieces of Ribbon by 7 dozen of Points, the product will be 14, which multiplied by 2 yards of Lace, produceth 28; and that multiplied by 81 ſhillings, produceth 2268 for a Diviſor.

Divide 4536 by 2268, the Quotient will be 2, and ſo many pair of Gloves will be bought for 28 ſhillings.

QUEST. 54.

There is a Gallery to be paved with Stones in the form of a long Square; each Stone is 28 *Inches long, and* 24 *Inches broad, and the Gallery is* 40 *yards long, and* 7 *yards*

broad. How many ſuch Stones will pave this Gallery?

Multiply the length of the Stone by the breadth, that is, 28 by 24, the product is 672 for your Diviſor.

Then multiply 40 yards the length, and 7 yards the breadth, both of them by 36, (the number of Inches in one Yard) and one product will be 1440, and the other 252; which being multiplied together, produce 362880: this number being divided by 672, the former Diviſor, the Quotient will be 540; and ſo many ſuch Stones will pave the ſaid Gallery.

QUEST. 55.

A Stationer would lay out 220 l. *in three ſorts of paper; ſome of* 5 s. *the Ream, ſome of* 6 s.

6s. the Ream, and ſome of 11 s. *the Ream: of all which ſorts he would have an equal number of Reams. The Queſtion is, How many Reams of each ſort muſt he have?*

ADde all the three prizes together, as 5 *s.* 6 *s.* and 11 *s.* they make 22 *s.* for your Diviſor; then then turn the 200 *l.* into ſhillings, they make 4400 *s.* for your Dividend.

Divide 4400 by 22, the Quotient will be 200; and ſo many Reams muſt he have of a ſort. For

200 Reams	at	5 *s.*	comes to	50
		6 *s.*		60
		11 *s.*		110
		22		220

QUEST. 56.

Five Merchants, viz. A, B, C, D, E, *have gained* 2025 l. *which is to be divided amongſt them in this ſort: So that the half of* A *his ſhare, ſhall be equal to* $\frac{1}{4}$ *of the ſhare of* B, *to* $\frac{1}{3}$ *of the ſhare of* C, *to* $\frac{1}{2}$ *of the ſhare of* D, *and to* $\frac{1}{1}$ *of the ſhare of* E. *I demand each Merchant's ſhare?*

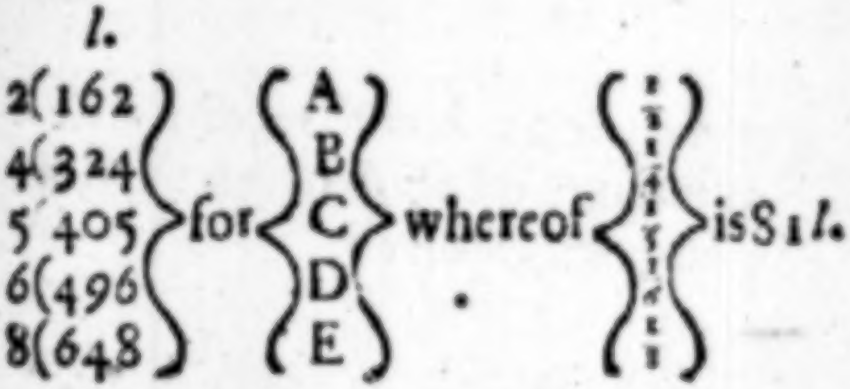
FInde any number that may be divided into ſuch parts as the ſeveral ſhares are to be parts of: Or take the ſeveral Denominators of the Fractions, *viz.* 2, 4, 5, 6, and 8, and adde them together, they make 25: Then ſay by the Golden Rule,

If 25 *gain* 2025 l. *what ſhall* 2 *gain?*

Multiply 2025 by 2, the product will

will be 4050; which divide by 25, the Quotient will be 162 *l.* for the ſhare of A, whereof the half is 81 *l.*

Work ſo with all the reſt of the numbers, 4, 5, 6, and 8, and you ſhall finde each mans ſhare as is here under expreſſed.



QUEST. 57.

If a Clock or Dial have 2 Indices or Hands, one whereof goeth about twice in one day, or 24 hours; and the other goes about but once in 30 days or 720 hours. If theſe two Hands be ſet together at

the ſame point, and go both one way, I demand in what time they ſhall again meet together?

TO anſwer this Queſtion, ſay by the Rule of Three,

If 1 *day, or* 24 *hours, require* 2 *Revolutions, what ſhall* 30 *days, or* 720 *hours require?*

Multiply 30 by 2, and thereof will come 60 Circumferences; from which ſubſtract 1, there remains 59: and from hence it appears, that in 30 days the ſwifter Hand would have gone about 60 times, and the ſlower Hand but once; therefore the ſwifter Hand gains of the ſlower Hand 59 Revolutions in 30 days: wherefore, ſay again by the Golden Rule,

If 59 *Circumferences require* 30 *days, or* 720 *hours, what* 1 *Circumference?*

Multi-

Multiply 720 by 1, the product will be 720; which divided by 59, the Quotient will be 12 hours $\frac{12}{59}$ of an hour, or 12 hours 12 minutes and 12 ſeconds; and in ſuch time will the 2 Indices, or Hands, meet.

QUEST. 58.

There is an Iſland 36 *miles in Compaſs: Now at the ſame time, and from the ſame place two Footmen* A, *and* B, *ſet forward to go round the ſame, and they follow one the other in ſuch ſort, that* A *travels every day* 9 *miles, and* B 7 *miles. The Queſtion is, to finde in what ſpace of time they would again meet; and alſo how many miles, and how*

many times about the Iſland each Footman would then have travelled?

TO anſwer this, from 9 miles (the number of miles that A goes in a day) ſubſtract 7 miles, (which B goes in a day) the difference is 2. Then ſay by the Golden Rule.

As 2 miles is to 1 day, ſo is 36 miles to what?

Divide 36 by 2, and the Quotient will be 18; and in ſo many days will they meet.

Again.

Multiply 18 by 9, and the product will be 162, and ſo many miles did A travel; which divide by 36, (the compaſs of the Iſland) the Quotient is $4\frac{2}{2}$, ſo that A travelled 4 times and an half about the Iſland. In like manner, multiply 18 by 7, you ſhall finde 126, which is 3 times and an half the compaſs of the Iſland; and ſo many times did B travel about the Iſland.

QUEST.

QUEST. 59.

Two Merchants, as A, *and* B, *are in Trade or Company, and the ſum of both their Stocks is* 300 l. *The Money of* A *continued in company* 9 *moneths, and the Money of* B *continued* 11 *moneths in company; by their two ſtocks* 200 l. *is gained; which upon account is equally divided. Now the Queſtion is, to know how much Money each Merchant did put in?*

ADde 11 and 9 (the times that each Merchants money was in ſtock) together, the ſum of them is 20: Then ſay by the Golden Rule, As 20, their ſums of the times, is

to

to 300, the ſum of their Stocks; ſo is 11 moneths, the time that B his Money was in, to 165 *l.* the Stock that A put in; and ſo is 9 moneths, the time that A his Money was in, to 135 *l.* the Stock that B put in: ——Now for the proof of this, multiply A his ſtock 165, by 9 Moneths his time, the product will be 1485. ——Alſo multiply B his ſtock 135 by 11 moneths his time, that product will alſo be 1485; which demonſtrates the Work to be true.

QUEST. 60.

Two Merchants A, *and* B, *do Company*; A *put into Stock* 325 l. *more than* B, *and* A *his Stock did continue in Company* 7 *moneths and an half.* B *put into Stock a certain ſum unknown, and it is continued in Company* 10 *moneths*

moneths and 3 quarters: After a certain time they divide the gain equally. The Queſtion is, what each Merchant did put in?

THe difference of their ſtocks was 325 *l.* A continued his ſtock $7\frac{1}{2}$ moneths; and B his ſtock was in $10\frac{1}{4}$ moneths: ſo that the difference of the time was $3\frac{1}{4}$ moneths. Wherefore multiply 325, the difference of their ſtocks, by $7\frac{1}{2}$, the time that A his ſtock was in, and the product will be $2437\frac{1}{2}$; which divide by $3\frac{1}{4}$, the difference of time that their ſtocks were in, and the Quotient will be 750 *l.* for the ſtock which B put in; to which adde 325 *l.* the ſum which A put in more than B., and the ſum will be 1075 *l.* for the ſtock which A put in.

Arithme-

Arithmetical RECREATIONS

Problematically Propounded, and Anſwered.

TO the foregoing *Queſtions*, I will here adde certain *Problems*, and give the *Anſwers* of them in general terms, leaving the Arithmetical Working of them to the Ingenious Practitioner, thereby the better to confirm him in his undertakings, to reſolve other *Queſtions* that may be propoſed to him.

PROBL.

PROBLEM 1.

There were 6 Cups of Gold which weighed together 600 Ounces, but each Cup was heavier than the other by one ounce; now how much did each Cup weigh ſeverally?

Anſwer. ONe (and the leaſt of the Cups) weighed 97 ounces and a half; the next 98 and a half; the third 99 and a half; the fourth 100 and a half; the fifth, 101 and a half, and the ſixth and biggeſt, weighed 102 ounces and a half: all which numbers being put together, make 600 ounces, equal to the whole weight.

PROBL.

PROBL. II.

There are four ſeveral Meaſures as A, B, C, D, *of which* D *holds* 24 *pints, and* C *holds as much again as* B, *and* 3 *times as much as* A; *and* D *with twice* A, *will hold double as much as* C, *and four times as much as* B. *How much did every one of theſe Meaſures hold ſeverally?*

ANſwer.

A	holds	6	Pints.
D		24	
C		18	
B		9	

So that C holds as much again as B, and three times as much as A; and D with twice A, holds as much as C, and four times as much as B.

PROBL.

PROBL. III.

A Father leaves 1000 l. *to be diſpoſed of to his Son and Daughter, conditionally thus; That the fifth part of that which his Son ſhould have, ſhould exceed the fourth part of that which the Daughter ſhould have, by* 10 l. *What muſt each have?*

Anſwer. THe Son had 577 *l.* and $\frac{3}{5}$ of a pound; and the Daughter 422 *l.* and $\frac{2}{5}$ of a pound. Now the fifth part of 577 $\frac{3}{5}$ is 115 $\frac{4}{5}$; - And the fourth part of 422 $\frac{2}{5}$ is 105 $\frac{1}{2}$, which is leſs than 115 $\frac{4}{5}$ by 10: —— And 577 $\frac{3}{5}$, and 422 $\frac{2}{5}$ being added together, do make 1000 *l.* equal to the whole Legacy.

PROBL.

PROBL. IV.

One coming into an Orchard, asked the Gardener how many Trees there were in that Orchard? the Gardener answered, That the one half of the Trees were Apple-trees, the Quarter-part Pear-trees, the ſeventh-part were Plumb-trees, and that there were 12 *Cherry-trees beſides. How many Trees were there in this Orchard?*

Anſw. THere were 112, the half whereof is 56, the quarter thereof is 28, and the ſeventh part is 16; theſe three Numbers added together, make 100; which with the 12 Cherry-trees make in all 112 Trees in the Orchard.

PROB.

PROBL. V.

Two perſons, as James *and* Paul, *had between them a certain number of Sheep in two Droves*; James *ſaid to* Paul, *If you put* 70 *of your Sheep into my drove, I ſhall have three times as many Sheep as you have*:---*But* Paul *ſaid to* James, *If you put* 70 *of yours into my drove, I ſhall have five times as many as you. How many Sheep had each of them?*

Anſw. JAmes had 110, and *Paul* had 130,—— For if you take 70 from *Paul* and adde them to *James*, then *James* will have 180, and *Paul* but 60, which is but one third part of

of what *James* hath: —— But if you take 70 from *James*, and give them to *Paul*, then *Paul* will have 200, and *James* but 40; which is but one fifth part of what *Paul* hath.

PROBL. VI.

The Father and Son travelling together, each of them carrying a certain number of bottles of Wine; the Son complains to the Father, that he was overladen: the Father replied, If I ſhould take one of your bottles, then I ſhould have as many more bottles as you have; and if I ſhould give you one of mine, yet I ſhould have as many as you have

have in all ſtill. How many bottles had each of them?

Anſw. THe Father had 7, and the Son had 5.——So if the Father had taken one of the Son's Bottles from him, the Son would have had but 4, and the Father 8, which is double the Son's number: and if the ſon had taken one from the Father, then they would have been both equal, for either of them would have had 6 Bottles. ——Many other Numbers may be found to do the like, which I leave for you to diſcover.

PROBL. VII.

One having in the Market a baſket of Apples, another comes & asks him how many there is of them? the owner replies, he cannot

cannot tell; but he remembers that when he told them into his basket by two and two, there was one odde one at laſt: Alſo when he told them in by three and three, there was ſtill one odde one; and alſo by four and four, there was ſtill an odde one remaining; the like when he told them in by five and five, and by ſix and ſix, ſtill one odde one remained: but when he told them in by ſeven and ſeven, then they fell even. How many Apples were there in his basket?

Anſw. HE had 721, which number being divided by 2, or 3, or 4, or 5, or 6, there will ſtill remain 1; but being divide by 7, there will remain nothing.

For

For 2, 3, 4, 5, 6, being multiplied continually into themſelves, will at length produce the number 720, to which adde a Unite, and it is 721, the number ſought. —— There are many other numbers which will afford the like, which I leave to your practice to finde of your ſelf.

PROBL. VIII.

If one ſhould buy 12 *Loaves of bread for* 12 *pence, ſo that ſome of them may be two-penny Loaves, ſome penny Loaves, ſome halfpenny loaves: and ſome farthing Loaves. How many of a ſort muſt he buy?*

Anſw. HE muſt buy 3 two-penny loaves, 4 penny loaves, 3 half-penny loaves, and 2 farthing loaves.

For

For,	*d.*
3 two-penny loaves are —	6
4 penny loaves are ——	4
3 half-penny loaves are ——	1 $\frac{2}{4}$
2 farthing loaves are ——	0 $\frac{2}{4}$
12 Loaves ——	Pence 12

There are other Numbers will do the ſame; which I leave to your finding out.

PROBL. IX.

There is 1000 l. *to be diſtributed amongſt* 10 *perſons, namely, ſome Men, ſome Women, ſome Male-children, and ſome Female-children; with this condition, That every Man muſt have* 50 l. *every Woman* 70 l. *every Male-childe* 130 l.

130 l. *and every Female-childe* 150 l. *How many muſt there be of each ſort?*

Anſw. THere may be 2 Men, 3 Women, 3 Male-children, and 2 Female-children.

For,	*l.*
2 Men, at 50 *l.* apiece, muſt have	100
3 Women at 70 *l.* muſt have	210
3 Male-childr. at 130 *l.* muſt have	390
2 Fem. childr. at 150 *l.* muſt have	300
10 Perſons.	Pounds 1000

There are other Numbers will do the like, which I leave for your practice to finde out.

PROBL. X.

A man dying, and leaving ſeven Sons, bequeaths his Eſtate in money to be thus divided; One half to his Eldeſt Son, the half of the remainder to his ſecond Son, the half of the remainder to his third Son; and ſo to all the ſeven; and the remaining half to an Executor, to ſee his Will performed; which remaining half was 34 l. *What was his whole Eſtate? and what every Childs part?*

Anſw. HIs whole Eſtate was 8670l. And of this, the Executor

	l.
tor had ———	34
The ſeventh ſon had——	68
The ſixth ſon-———	136
The fifth ———	272
The fourth ———	544
The third———	1088
The ſecond--———	2176
The firſt ———	4352
In all———	8670

PROBL. XI.

A man dying, gave to his Eldeſt Son $\frac{2}{3}$ *of* $\frac{1}{2}$ *of his Eſtate; to his ſecond Son* $\frac{1}{3}$ *of* $\frac{1}{2}$ *of his Eſtate; and when they had counted their Portions, the one had* 40 l. *more than the other: the remainder of the Eſtate was given to the Wife and younger Children. The Queſtion is, How much was*

the first and second Sons Portions? and how much was left to the Wife and younger Children?

Answ. THe Eldest son's Portion was 100 *l.* The second son's 60*l.* And for the Wife and younger Children 440*l.*

PROBL. XII.

One delivered to a Banker a certain sum of money, to have of him by the year only simple Interest, at the rate of 6 per Cent. *and at the end of* 10 *years he received of the Banker* 500 l. *in full for Principal and Interest. What was the sum at first delivered?*

Answer, 312 *l.*-10 *s.*

PROB.

PROBL. XIII.

One man in a Morning demanded of another what it was a clock? The other answered, If you adde the $\frac{1}{4}$ of the hours which be past since Midnight, to the $\frac{2}{3}$ of the hours which are to come till Noon, you shall know the true hour that now it is: What was it then a Clock?

Answ. FIve hours and 44 Minutes, and somewhat better.

PROBL. XIV.

A Dog, a Wolf, and a Lyon, are to devour a Sheep; and supposing that the Dog could eat

up the Sheep in one hour, the Wolf in 3 quarters of an hour, and the Lion in half an hour: Now if the Lion begin to eat 7 Minutes and an half before the Dog and Wolf, and afterwards all three eat together; In what time will the Sheep be devoured?

Answ. THe Sheep would be devoured in 17 Minutes and 53 seconds of time.

PROBL. XV.

If a House be to be built by 3 Bricklayers A, B, *and* C, *they working in such sort, that* A *alone will finish it in* 30 *daies,* B *alone in* 40 *daies, and* A B *and* C *together in* 15 *daies;*

In

In what time could C *alone build that houſe?*

Anſwer. In 120 daies.

Concerning two Neighbours Changing of their Land.

Two Neighbours had either of them a piece of Land, the one Field was four-ſquare, every ſide containing 120 *Perches, ſo that it was round about* 480 *Perches. The other was ſquare alſo, but the ſides longer than the others Field, and the ends ſhorter: for the ſides of this field were* 140 *Perches long apiece, and the ends thereof were* 100 *Perches apiece; ſo that this Field was*

480 *Perches about as well as the other. Now, which of theſe two had the beſt Bargain?*

IT is wonderful to ſee how Numbers will diſcover that to be erronious and abſurd, which to common ſenſe and mans apprehenſion appears reaſonable; as in this Bargain.—*Firſt*, For the field, which is 120 Perches on either ſide.——Multiply 120 by 120, and the product is 14400: and ſo many ſquare Perches doth that piece of Land contain, that is 80 Acres.——Then for the other field,—Multiply 140 (the length of one of the longer ſides of the field) by 400 Perches, (one of the ſhorter ſides) and the product will be 14000 Perches, the content of the other field; which is leſs than the former by 400 Perches, that is two Acres and an half. And ſo much would he have loſt that had the field of 120 Perches on every ſide,

ſide, though the other field were as much about.

And this errour would ſtill grow greater, the narrower the ſecond field had been: As ſuppoſe the ends or ſhorter ſides thereof had been but 40 Perches apiece, and the longer ſides 200 apiece, this field would ſtill have been 480 Perches about: But let us ſee how much it contains.—— Multiply 200 the longer ſide, by 40 the ſhorter ſide, and it will produce 8000; and ſo many ſquare Perches will it contain, which is but 50 Acres: So that if he had changed for this field, which is as much about as his, he would have then loſt 30 Acres by the bargain.

About the borrowing of Corn.

A Country-Farmer had in his Houſe a Veſſel of Wood full of

Wheat, which was 4 foot high, 4 foot broad both at top and bottom; and in all parts 4 foot, as the ſides of a Die.---- One of his Neighbours deſires him to lend him half his Wheat till Harveſt; which he doth:---Harveſt coming, and his Neighbour is to repay; he makes a Veſſel 2 foot every way, as his Neighbours was 4 foot every way, and fills him that twice, in lieu of what he borrowed. Was there gain or loſs in this particular?

EXamine firſt what either of theſe Veſſels will hold, and by that you will diſcover the fallacy.---*Firſt*, The Veſſel 4 foot high contains 48 Inches of a ſide; wherefore multiply 48 by 48, and the product will be 2304; which multiply again by 48, and the product will be 110592: and

and ſo many Cubical or ſquare Inches of Corn did his Veſſel hold; the half whereof, which is 55296, he lent his Neighbour. Now *Secondly*, Let us examine how much the ſecond Veſſel will hold, it being 2 foot on every ſide, that is 24 Inches. —Multip'y 24 by 24, and the product is 576; which divide again by 24, and the product will be 13824; and ſo many Cubical or ſquare Inches did the leſſer Veſſel contain; which being filled twice, it made 27648 Cubical Inches of Corn or Wheat; which was all he paid his Neighbour in lieu of the 55296 Inches which he borrowed; which is but the juſt half: and ſo allowing 2256 Cubical Inches of Wheat to make a Buſhel, (for ſo many there is in a Buſhel) he paid his Neighbour leſs by 12 Buſhels, and about a Peck, than he borrowed of him. And this, and the reaſon of it, is evident, as I will demonſtrate to you by a familiar preſident. —If you cauſe a Die to be made of one Inch every

every ſide, and 8 other Dies to be made of half an Inch every ſide; theſe 8 being laid cloſe one to another in a ſquare form, theſe 8 will be but of the ſame bigneſs with the other one Die, whoſe ſide is but an Inch.

A Bargain between a Farmer and a Goldſmith.

A rich Farmer being in a Fair, eſpies at a Goldſmith's Shop a Neck-lace of Pearl, upon which were 72 Pearls: The Farmer cheapening of it, the Goldſmith asked 30 s. a Pearl; at which rate the Neck-lace would come to 103 l. *The Farmer looking upon it as dear, goes his way, offering nothing: Wherenpon the Gold-*

Goldſmith calls him, and tells him, if he thought much to part with Money, he would deal with him for Corn :---- To which the Farmer hearkens; asks him how much Corn he would have for it at two ſhillings the Buſhel: The Goldſmith told him, he would be very reaſonable, and would take for the firſt Pearl one Barly-Corn only, for the ſecond two Corns, for the third four Corns; and ſo doubling the Corns till the 72 Pearls were out. To this the Farmer agrees, and immediately ſtrikes the Bargain: But ſee the event.

HE that hath any skill in Numbers, will eaſily diſcern the vanity that there is in this kinde of bargain-

bargaining; ſo that no man can be bound to them: For Numbers increaſing in a Geometrical Progreſſion, do ſo prodigiouſly increaſe, that (to thoſe that are ignorant of the reaſon) it will ſeem impoſſible they ſhould do ſo; but that it is ſo, will appear evident by this bargain, if you enquire, *Firſt*, The quantity: *Secondly*, The worth of ſo much Barley in Money: and, *Thirdly*, The weight of it, and how it ſhould be removed, or where ſtowed. Wherefore,

1. If we allow 10000 *ten thouſand* Corns to a Pint, (which is more than enough) then 5120000 Corns will make a Quarter: but yet (for the eaſe of them that will make trial) we will allow 10000000 Corns to make a Quarter; by which number if you divide the whole number of Corns that the 72 Pearls would have amounted unto, being doubled, (which by cutting off the 7 laſt figures towards the right hand) the Quotient of that Diviſion would be

472236648286964 and

and ſo many whole Quarters of Barley would the Neck-lace have amounted unto, and ſome odde Buſhels, which we here omit as ſuperfluous.

2. Now for the worth of this Barley, ſuppoſe it were ſold at 15 *d.* the Buſhel, (which is a reaſonable rate) that is 10 *s.* the Quarter: wherefore divide the foregoing number of Quarters by 2; that is, take half of it, and it will be 236118324143482 pounds Sterling; which ſum rendred in words, is, *Two hundred thirty ſix millions of millions, one hundred and eighteen thouſand, three hundred twenty four millions, one hundred forty three thouſand, four hundred eighty two* pounds. A vaſt ſum of Money for a Farmer. And thus, if you reckon Land for ever worth 20 years purchaſe; if you divide this ſum of pounds by 20, the Quotient being 11805916202174, is the yearly Rent thereof: which is, *Eleven millions of millions, eight hundred and five thouſand nine hundred and ſixteen millions, two*

hundred

hundred and two thousand, one hundred and seventy four pounds a year. And again, if you divide this number of pounds by 365, (the number of daies in a year) the Quotient will be 32344975918; that is, *Thirty two thousand, three hundred forty four millions, nine hundred seventy five thousand, nine hundred and eighteen* pounds a day for ever. So great vanity may be agreed and concluded upon by people ignorant of this Science, and for want of serious premeditation. But,

3. Let us consider the weight of so much Barley. If we allow 8 Bushels (or one Quarter) to weigh two hundred weight; (but doubtless it weighs more) then the whole number of Quarters Multiplied by 2, gives the weight of all the Barley to be 944473296573928 hundred weight. And if you divide this number by 20, the quotient will be 47223664828696 Tuns; that is, *Forty seven millions of millions, two hundred twenty three thou-*

thouſand, ſix hundred ſixty four millions, eight hundred twenty eight thouſand, ſix hundred ninety ſix Tuns; which will require 472236648 28; that is, *Forty ſeven thouſand two hundred twenty three millions, ſix hundred ſixty four thouſand, eight hundred twenty eight* ſhips of a thouſand Tun apiece to carry it. And to conclude, If there were *Four millions* of Nations in the World, and every one of thoſe Nations had *Ten thouſand* ſail of ſuch ſhips of a *Thouſand* Tun apiece; yet all thoſe ſhips would not contain it. Thus by this you may ſee, how prodigiouſly Numbers do increaſe, being multiplied according to Geometrical Progreſſion.

Concer-

Concerning an Agreement that a Country-Fellow made with a Farmer.

A Country Fellow comes to a Farmer, and offers to ſerve him for 8 *years; all which time he would require no other Wages than one grain of Corn, and one quarter of an Inch of Land to ſow it in the firſt year; and Land enough to ſow that one Corn, and the encreaſe of it, for his whole* 8 *years: to which the Farmer aſſents.*

THeir Bargain being thus made, let us conſider what his eight years ſervice will be worth. For the firſt

firſt year he hath onely one quarter of an Inch of Ground, and one Corn; which Corn we will ſuppoſe had in the Ear at the years end 40 Corns, (for that is few enough:) then the ſecond year he muſt have 40 ſquare quarters of Inches of gound to ſowe thoſe 40 Corns in, that is, 10 ſquare Inches of ground. And the third year, ſuppoſing thoſe 40 Corns to produce 40 Ears, and in each Ear 40 Corns, as before, they will be in the third year increaſed to 1600 Corns; ſo that he muſt have 1600 ſquare quarters of Inches to ſowe that increaſe in, which is 40 ſquare Inches: and thus continuing till the 8 years be expired, the increaſe would be 6553600000000 Corns; that is, *Six millions of millions, five hundred fifty three thouſand and ſix hundred millions* of Corns; and ſo many ſquare quarters of Inches of Land muſt he have to ſowe this increaſe in. Now know, that 36000000000 Corns, that is, *Three thouſand and ſix hundred millions*

millions of ſquare Inches, do make a mile, upon the ſuperficies or plain; and that ſuperficies of a Mile will be capable to receive 144000000000; that is, *Fourteen thouſand and four hundred millions of Corns:* wherefore divide 655360000000000 (the whole number of the Corns increaſe) by 144000000000, (the number of corns that one Mile ſquare of Land is capable to receive) and in the Quotient you ſhall have 455; and ſo many Miles ſquare of Land muſt there be, to contain the ſowing of the increaſe of one Corn in 8 years, which will be about 420000; that is, *Four hundred and twenty thouſand* Acres of Land; which being rated at half a Crown an Acre by the year, it will amount unto 50000, that is *Fifty thouſand* pound; which is 6250, that is, *Six thouſand two hundred and fifty pound a year*: A very conſiderable Salary for eight years ſervice.

By

By theſe and the like Contracts, we may ſee what abſurdities are and may eaſily be committed, which you ſee the ſubtilty of Numbers eaſily diſcovers. I will give you by way of Diſcourſe, ſome preſidents concerning the increaſe of Creatures of ſeveral kindes, which you may make trial of for your Recreation; As,

I.

WHat think you, if one ſhould tell the Great *Turk* (or any other Potentate in the World, who hath a great Army in the field in continual pay) that all the Revenue appertaining to his Crown, will not for one years time maintain all the Pigs that one Sow, with all the Pigs of her race, and the increaſe iſſuing of them, ſhall produce in 12 years; notwith-

notwithſtanding he can maintain ſo great an Army in the field. Doubtleſs, he would take it unkindly: But conſider; Imagine the Sow brings forth but 6 Pigs at a Litter; of which we will allow two to be Barrow, (and this ſuppoſition is as little as may be) and then imagine that every of thoſe 4 bring as many every year, and the increaſe of them the like, during the term of 12 years; they and their race at the end of the time will be encreaſed to *Three and thirty millions of* Pigs: Now if we allow 5 ſhillings for to maintain one of theſe Pigs for a year, which is not full half a farthing a day; yet there muſt be *Three and thirty millions of Crowns* to maintain them one year; which will make a great hole in a large Revenue.

Would

II.

WOuld any man (that hath not skill in Numbers) imagine that 100 Sheep, and the increaſe thereof, being preſerved for the ſpace of 16 years, ſhould be worth above *One million ſix hundred and twenty thouſand pound* Sterling? Yet if every Sheep do produce but one every year, at the expiration of 16 years, 100 ſheep will increaſe unto 6553600 which is, *Six millions, five hundred fifty three thouſand, ſix hundred* ſheep. Now ſuppoſing theſe to be worth but five ſhillings apiece, they would at that rate amount unto 1638400; that is, *One million, ſix hundred thirty eight thouſand, four hundred pounds* Sterling.

III.

IN Numbers there is a ſubtile property, which ſome have above others; of which I will give you a few: As,

1. Is it not ſtrange that there is but one whole Number to be found, which being doubled, ſhall produce the ſame ſum as it would if it were multiplied in it ſelf ſquarewiſe? and that is the number 2: For 2 and 2 added together, make 4; and ſo if you multiply 2 by 2, it ſhall produce 4 alſo: and you can finde no other whole number which hath the like property.

2. There is a ſecret property in the Numbers 5 and 6; for if you multiply either of theſe numbers in themſelves, the numbers produced by thoſe multiplications, ſhall terminate or end

end in themſelves: As 5 multiplied by 5, produceth 25, which alſo ends in 5. Likewiſe 6 multiplied by 6, produceth 36, which terminates in 6 alſo. Alſo if any greater numbers ending in 5 or 6, be yet farther multiplied by 5 or 6, they will continually terminate or end in 5 and 6. So 325 multiplied by 5, produceth 1625; and 746 multiplied by 6, produceth 4476; the one ending in 5, the other in 6.

3. The number 9 hath a priviledge above all other numbers: for if you take any number, the nines taken in the groſs ſum all together, or in the parts ſeverally, will be ſtill the ſame; as in the number 36, it makes 4 times 9; ſo that if you take the nines out of 36, they are in number 4: And if you multiply 9 by 4, it will alſo produce 36; alſo if you take the nines out of 240, it is all one as if you ſhould take the ſum of the ſimple figures 2, 4, and 0; for 2 and 4 is 6: ſo if you divide 240 by 9, you

ſhall finde 6 remaining, which is equal to 4 and 2.

4. There is a fine harmony between theſe two numbers, 220, and 284, that the aliquot-part of the one, do make up the ſum of the other; as thus, The parts of 220 are 110, 55 44, 22, 20, 11, 10, 5, 4, 2, 1: the ſum of which aliquot-parts do make 284; and the aliquot-parts of 284, are 142, 71, 4, 2, 1; which added together make 220: And this harmony is not to be found in many other Numbers.

5. But the number 6 hath an eminent Propriety, for his parts are equal to himſelf; thus his half which is 3, his third which is 2, and his ſixth part which is 1, being added together, do make 6; and how rare ſuch numbers are to be found, do you judge; for between One, and ----------1000000000000, that is *One million of millions*, there are but Ten of ſuch Numbers to be found, and theſe are theſe that follow:

1	6
2	28
3	486
4	8128
5	120816
6	2096128
7	33550336
8	536854528
9	8589869056
10	137438691328

In which Numbers you may obſerve, that orderly and ſucceſſively, One ends in 6, the next in 8; that is, every odde number, as the firſt, the third, the fifth, the ſeventh, and the ninth, do end in 6, whoſe half is 3, an odde number; and the even places, as the ſecond, fourth, ſixth, eighth, and tenth numbers end in 8, the half thereof being 4, an even number. And if you proceed to finde more of theſe Numbers, you may finde the twentieth number, that hath this quality, to be —

-1511157-745155376893:328.

6. In Square and Cube Numbers there are ſubtile properties; as, if from an Unite you do ſucceſſively adde the odde numbers, all thoſe numbers ſhall be ſquare numbers; as if to 1, or Unity, you adde the next odde number, which is 3, the ſum is 4, a ſquare number; to which adde 5, the next odde number, and the ſum is 9, a ſquare number alſo; to which adde 7, the next odde number, and the ſum is 16, a ſquare number alſo; and ſo on, as in this little Table.

For,	1	3	is	4	Square Numbers.
	4	5		9	
	9	7		16	
	16	9		25	
	25	11		36	
	36	13		49	
	49	15		64	
	64	17		81	
	81	19		100	

So

So likewiſe, if Cubick Numbers be ſucceſſively added from Unity, theſe Numbers ſhall alſo be Square Numbers.

7. It is worth the obſerving, that no exact ſquare Number can end with any of theſe figures; as 2, 3, 7, or 8.

Compendious
RULES
IN
ARITHMETICK.

By which

Some ſeeming Difficulties and common Obſtacles are removed, and the performance of them rendered familiar and eaſie.

Compendium 1.

In the dividing of any great Sum, how you ſhall certainly know what Figure to put in your Quotient; ſo that you ſhall never take too much, nor too little, but always the right; and divide your Sum by Subſtraction onely, without Multiplication.

Firſt, write down all the nine Digits orderly one under another, and then by the ſide of them draw a right line, and againſt the figure 1, (towards your right-hand) ſet down your Diviſor; and multiply it by all the 9 Digits, ſo ſhall you ſee againſt every figure how much the Multiplication

cation of your Diviſor by any Digit will amount unto: So that when you ſee your Remainer in your Diviſion, look in this little Table for the neareſt number leſs than your Remainer; and that figure which ſtandeth againſt that Number, you muſt always put in your Quotient.

Example. Suppoſe you were to divide any great ſum (as 98204602) by 3989, your firſt work is to ask, How many times 3989 (your diviſor) can you have in 9820, the four firſt figures of your dividend. —— Look in this little Table for the neareſt number you can to 9820, which is leſs, and you ſhall finde the neareſt number leſs to be 7978, which number ſtandeth againſt the figure 2; wherefore ſet 2 in your Quotient, and ſubſtract 7978 out of 9820, and there

	Diviſor.
1	3989
2	7978
3	11967
4	15956
5	19945
6	23934
7	27923
8	31912
9	35901

there will remain 1842; to which the next figure of your dividend being added, makes it 18424. Then you are to ask, how many times 3989 you can have in 18424. Look in your Table for the neareſt number to 18424, and you ſhall finde the neareſt leſs to be 15956, againſt which ſtands the figure 4; therefore place 4 in the Quotient, and ſubſtract 15956 out of 18424 and there will remain 2468; which with the next figure of your Dividend 6, maketh 24686. —Then ask how often you can have 3989 in 24686; the neareſt number in the Table leſs than this, is 23934, againſt which ſtands 6: place 6 in your Quotient, and ſubſtract 23934 from 24686, and there remains 752, which with the next figure of your Dividend 0, makes 7520.——Then ask how often you can have 3989 in 7520; look for the neareſt number to 7520, and you ſhall finde the neareſt number leſs to be your Diviſor, 3989, ſtanding againſt the figure

gure 1; wherefore place 1 in the Quotient, and ſubſtract 3989 out of 7520, and there will remain 3531, which with the next figure of your Dividend 2, maketh 35312.--- Then ask how many times 3989 can you have in 35312; the neareſt number in the Table leſs, is 31912, againſt which ſtands the figure 8: ſet 8 in your Quotient, and ſubſtract 31912 from 35312, and there will remain 3400.—And ſo is your Diviſion ended, the Quotient being 24618, and $\frac{3400}{7520}$ remaining.

I have

I have here inſerted this Example, though not after the uſual way of Diviſion; but it may be uſed to any kinde as well as this.

(3400 *Remai.*
3531
752
2468
1842

Diviſ. 3989) 98204602 (24618 *Quot.*
.....

7978
15956
23934
3989
31912

98204602 *Proof.*

The making of the little Table is eaſie, it being made by *Addition* only, thus: Having ſet down your *Diviſor* 3989, double it, and it is 7978; which ſet againſt the figure 2; then adde them two numbers together, and they

they make 11967, which ſet againſt the figure 3; then to that number adde 3989, and it makes 15956, which ſet againſt the figure 4; to this adde ſtill the firſt number (your Diviſor) 3989, and it will produce the Numbers as in the Table: and ſo muſt you do with any other Diviſor.

And by this means *Multiplication* and *Diviſion*, which are the two difficulteſt parts of Arithmetick, are eaſily and exactly performed by *Addition* and *Subſtraction*, without any charge to the Memory.

Compendium 2.

In caſe a falſe Figure be placed in the Quotient of any Diviſion, how to rectifie that Quotient without beginning the Work anew.

WHen you have divided any Sum, if the Remainer at laſt be

be either greater or equal to the Divisor, the Quotient is false; which may be rectified without beginning the Work again, by dividing the Remainer only by the same Divisor; for thereof will arise a new Quotient, which added to the former Quotient, the sum of them will be the true Quotient.

So if 7290 be divided by 27, the numbers being placed according to the usual way of Division.

Because 27 can be had in 72 but twice, set 2 in the Quotient, saying, two times 27 is 54, from 72, and there remains 18, which write over 72, cancelling your other figures: Then say, How many times 27 in 189? say 7; but if you should mistake, and write 5 in the Quotient, and say, 5 times 27 is 135, out of 189, there remains 54, which write down as before, and remove the Divisor, and

```
  2
  59
 1847
 7290(259
 2777
  22
```

and ſay, How many times 27 in 540? the anſwer is 20, but muſt never be above 9 : Say therefore, 9 times 27 is 243, out of 540, and the remainer is 297, which being the laſt remain, (and greater than the Diviſor) ſhews the Work to be falſe, and the Quotient 359 to be too little.

Wherefore, divide the laſt remainer 297 by 27, and the Quotient will be 11, and nothing remaining: wherefore, if you adde this Quotient 11, to the other Quotient 259, the ſum of them 270, will be the true Quotient of 7290 divided by 27.

Compendium 3.

How to abbreviate your Work in Multiplication and Diviſion, when your Multip'ier or Diviſor

for consists of an Unite, with 1, 2, 3, or more Cyphers.

1. THus, if 365 were to be Multiplied by 10, adde one Cypher thereunto, making it 3650, and it is done: if it were to be multiplied by 100, adde 2 Cyphers to it; if by 1000, adde 3 Cyphers to it, and your work is ended.

In Division likewise, if 763258 were to be divided by 10, cut off the last figure towards the right hand, and the rest of the figures is the Quotient; so the Quotient of 763258 divided by 10, is (76325 $\frac{8}{10}$: if by 100, it is (7632. $\frac{58}{100}$: if by 1000, it is (763 $\frac{258}{1000}$, &c.

3. Also if the Multiplier consist of one or more Cyphers in the last place, you may omit the multiplying of them, and set them down at last; as if it were required to multiply 3257 by 2600:

Place

Place the Numbers as as you see here done; then multiply 3257 by 26, the product will be 84682; to which if you adde two Cyphers for the two Cyphers in the Multiplier, then it will be 8468200, which is the true Product.

```
3257
2600
-----
19542
6514
-------
8468200
```

4. Also if Cyphers be in the middle of the Multiplier among other figures, you may abbreviate your Work by removing your next figure a place farther where any Cypher comes.

As if 682357 were to be multiplied by 30204: Place the figures as is here done;

```
682357
 30204
-------
2729428
1364714
2047071
-------
20609910828
```

Then

Then Multiply 682357 by 4, it produceth 2729428; then (becauſe a Cypher is next) skip one place, and multiply it by 2, it produceth 1364714, ſetting your 4 two places from your right hand towards the left: then for the next place, being a Cypher, do the like, ſetting your multiplication by 3, namely 2047071, two places yet forwarder towards the left hand; then adde theſe three lines together, in the ſame order they now ſtand, and they make 20609910828, which is the true product of that multiplication.

Compendium 4.

How you may moſt compendiouſly and ſpeedily multiply by any of the nine Digits, without charging of the Memory.

I. *To Multiply any Number by* 2.

EIther double it, or ſet it down twice, and adde the two ſums toge-

together; but it is beſt done by doubling it in your minde.

So if you were to multiply 73684 by 2; it being ſet down once, begin at the right hand, and ſay, 4 and 4 is 8; ſet down 8; then 8 and 8 is 16, ſet down 6 and carry 1; then ſay 6 and 6 is 12, and 1 carried is 13, ſet down 3 and carry 1; then ſay 3 and 3 is 6, and 1 is 7, ſet down 7. Laſtly, 7 and 7 is 14, which being the laſt figure ſet 14 down, and your Multiplication is ended, and will ſtand thus:

147368.

II. *To Multiply any Number by* 3.

To the Number given, adde the double thereof, the ſum of them ſhall be the product.

So if you were to multiply 73684 by 3, firſt double it, or multiply it by 2, as before, and it maketh 147368, to which if you adde the given number 73684, the ſum of them will be 221052,

221052. which is equal to the product, as by the Work appears.

73684 Number given.
147368 its double.

221052 Multiplied by 3.

III. *To Multiply any Number by* 4.

Double the Duplication thereof, and your work is ended.

So if you were to multiply 73684 by 4, the Duplication thereof was 147368, which being doubled in your minde, or otherwise set down, giveth 294736, which is the product of 73684 multiplied by 4, as here appeareth;

73684 Number given.
147368 its Duplication.

294736 Multiplied by 4.

IV. *To Multiply any Number by* 5.

To the Number given adde a Cypher, or in your minde conceive one to be added: the half of that number is the product thereof multiplied by 5.

So if you were to multiply 73684 by 5, ſet, or conceive a Cypher after the 4, then it is 736840; then beginning at the left hand, ſay, The half of 7 is 3, and 1 remaining: ſet down 3, and in your minde carry 1 to 3, making it 13: Then ſay, The half of 13 is 6, and 1 remaining; ſet down 6 and carry 1; then the half of 16 is 8, ſet down 8; then the half of 4 is 2, ſet down 2: Laſtly, the half of 0 is 0, ſet down 0, and your Work is ended; the product 4 being 368420, as by the Work appears.

(Cypher added.
736840 the number given, with a
368420 its multiplication by 5.

V

V. *To Multiply any Number by* 6.

To the Number given adde a Cypher; then take the half of that number, and to it adde the number given, the ſum of them ſhall be the product of the given number multiplied by 6.

So it you were to multiply 73684 by 6, adde a Cypher thereto, and it is 736840, the half whereof is 368920, to which if you adde 73684 (the number given) the ſum of them will be 442104, which is the product of 73684, being multiplied by 6. As here appeareth.

(Cypher added
736840 the number given, with a
368420 the half thereof.
73684
-
442104 the product multiplied by 6.

VI. *To Multiply any Number by* 7.

To the Number given adde a Cypher

pher, and take the half thereof; adde this half to the double of the number given, the ſum thereof ſhall be the product of the given number multiplied by 7.

So if you were to multiply 73684 by 7, adde a Cypher thereto, and it is 736840; the half of this number is 368420, which being added to 147368, the double of the given number, the ſum will be 515788, which is the product of the given number 73684, being multiplied by 7: as here appeareth.

147368 the double of the given num(ber.
368420 half the given number, a Cy(pher added.
515788 the product, being multiplied (by 7.

VII. *To Multiply any Number by* 8.

Double the Number given, and ſubſtract that doubled number from the given number, a Cypher being added thereto. So

So if you were to multiply 73684 by 8, the double of the given number is 147368; this being ſubſtracted from 736540, (which is the given number with a Cypher added) the remainer will be 589472, which is the product of the given number 73684, being multiplied by 8; as here appears.

(pher added.
736840 number given, with a Cy-
147368 double of the given number.

589472 product multiplied by 8.

VIII. *To Multiply any Number by 9.*

Adde a Cypher to the given Number, and from that number ſubſtract the given number, the remainer ſhall be the product.

So if you were to multiply 73684 by 9, adde a Cypher to it, and it will be 736840; from which if you ſubſtract 73684, your given number, the remainer will be 663156; which

is the product of the given number multiplied by 9: As here appeareth.

736840 given number with a cypher.
73684 the given number substracted

663156 Product multiplied by 9.

IX. *To Multiply any Number by* 10.

Adde a Cypher to the given number, and the Work is done.

So 4327 multiplied by 10, is 43270

X. *To Multiply any Number by* 11.

Remove the Number given to the left hand one place, and adde both together for the product.

So if you were to multiply 3762 by 11, set them thus: adde both numbers together, and the product will be——41382

3762
3762

XI. *To Multiply any Number by* 12, 13, 14, 15, 16, 17, 18 or 19.

Multiply 786 by 12
Set the Numbers thus: then
say, two times 6 is 12, set
down 2 and keep 1 in your
minde; then two times 8 is 16,
and 1 in minde is 17, and 8 over 1
is 23, set down 3 and carry two tens.
Next say, two times 7 is 14, and 2
carried is 16, and 8 over 1 is 24, set
down 4 and carry 2, which added to
the last figure 7 it makes 9, which
set down, so is the product 9432.

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786
 12
----
9432
```

And so

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468 }
 14 } will be 6552
-----
6552
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365 }
 18 } will be 6570
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6570
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12 Com-

Compendium 5.

How readily to know how many Pounds are contained in any number of Shillings, without writing them down, or troubling the Memory.

CONceive the laſt figure of the number given to be taken away, or cut off with a daſh of the Pen; then the half of the other part of the number are pounds; and if 1 remain, that 1 is 10 *s.* and the figure cut off (or ſuppoſed to be cut off) are ſhillings alſo.

Example.

In 624‖7 *Shillings, how many Pounds?*

Suppoſe the 7 to be cut off; then the half of 6 is 3, ſet down 3; the half of 4 is 2, ſet down 2; the half of

of 2 is 1, ſet down 1: ſo is therein 6427 ſhillings, 321 *l.* 7 *s.*

642‖7 Shillings
Pounds 321-7 Shillings.

In 579‖8 *Shillings, how many Pounds?*

Suppoſe the 8 to be cut off, then ſay, The half of 5 is 2 and 1 remaining, ſet down 2 and carry 1; then ſay, The half of 17 is 8, and 1 remaining, ſet down 8 and carry 1; then ſay, the half of 19 is 9, and 1 remaining, ſet down 9, which being your laſt figure, the 1 remaining is 10 *s.* which you muſt adde to the 8 that was cut off, and it makes 18 *s.* So that in 5798 ſhillings there are 289 *l.*-18 *s.* As here appeareth.

X X (1 *s.*
579‖8 ſhillings.
289 pounds 18 *s.*

If you would turn Pounds at one work into Pence, then multiply the Pounds by 140, and the product is Pence.

So 235 *l.* being multiplied by 240, produceth 56300 pence.

On the contrary, to bring Pence into Pounds at one work, divide the Pence by 240, and the Quotient will be Pounds.

So 56300 pence being divided by 240, produceth in the Quotient 235 *l.*

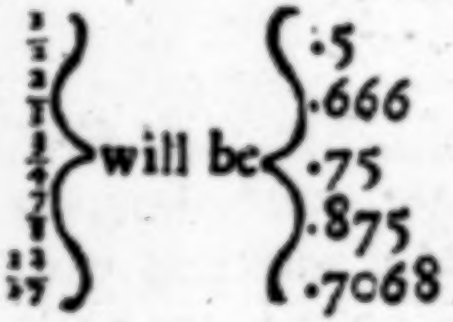
Compendium 6.

How to turn any common Fraction into a decimal Fraction.

ADde Cyphers as many as you please to the Numerator of the Fraction, and divide the sum by the Denominator, the Quotient shall be a decimal Fraction equal to the vulgar Fraction.

Let $\frac{1}{4}$ be to be reduced into a decimal.

mal Fraction, to 3 add 2, 3 or more Cyphers, and divide that by 4, so shall the Quotient be 75, which must be written thus .75 with a point before it; and that is the decimal Fraction of ¾. Likewise the decimal Fraction of



And so of any other.

Compendium 7.

When any Question is propounded in the Rule *of* Three, *where Halves, Quarters, or three Quarters of Weight or Measure are in the Question, or where Nine-pences, Six-pences, or Three-pences are ingre-*

ingredients, how you ſhall reſolve ſuch Queſtions without the help of Fractions, or reducing of your Money, Weight, Meaſure, to their leaſt Denomination.

YOu muſt here ſuppoſe your mony, Weight, or Meaſure, the Integer, to be divided into 100 parts; which being preſuppoſed, the 25 is a Quarter, 50 is Half, and 75 is three Quarters of any Money, Weight, or Meaſure.

This preſuppoſed, we will proceed to *Example* 1.

If

If 3 yards of any thing cost 1 s. 3 d. what will 85 yards cost?

3 —— 11.25 —— 85

85

5625

9000

956.25

l.	*s.*	*d.*
15	18	9

xxx

3)956x5(318.75

33333

Here instead of 11 *s.*–3 *d.* I set down 11.25, the 11 signifying 11 *s.* and the 25 3 *d.* which is the quarter of a shilling; and then I multiply and divide, as if it were all whole numbers. For multiplying 11.25 by 85, the product is 956.25; the 25 at the end separated by a prick, is the fraction of a quarter. This number divided by 3, the Quotient is 318.75, that is, 318 *s.* and 75, that is

is three quarters of a ſhilling, or 9 *d.* So that if 3 yards coſt 11 *s.*—3 *d.* 85 yards will coſt 318 *s.* and 9 *d.* which is 15 *l.*—18 *s.*—9 *d.*

Example 2.

If $6\frac{1}{2}$ *Ells of any Commodities coſt* 12 l. 15 s. *what ſhall* $37\frac{1}{2}$ *Ells coſt?*

Set your numbers thus:

Ells.	*l.*	*Ells.*
If 6.50	—*coſt*— 12.75	—*what*— 37.25

12.75

18625
26075
7450
3725

4749375

x,x 4
5047
4749375 (73.06
655550
666

Here inſtead of 6 Ells and $\frac{1}{2}$, I ſet down

down 6.50, 50 being the half of 100. Again, for 12 *l.*–15 *s.* I set down 12.75, 75 being three quarters of 100, as 15 *s.* is ¼ of a pound. And lastly, for 37 Ells and a quarter, I set down 37.25, 25 being one quar- of 100.

And then multiplying and dividing of these as whole numbers, according to the nature of working the *Rule of Three*, I finde my Quotient to come out 73.06, that is 73 *l.* $\frac{06}{100}$ parts of a pound, or 20 *s.* which reduced, is 1 *s.*--2 *d.*--1 *q.* $\frac{6}{10}$ of a farthing. So that if 6 ½ Ells cost 12 *l.* 15 *s.* 37 ¼ Ells will cost 73 *l.*--1 *s.*-- 2 *d.*--1 *q.* $\frac{6}{10}$.

FINIS.